THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXV. No. 612.] LONDON, FEBRUARY 2, 1875. [27TH YEAR.] Price 6d.

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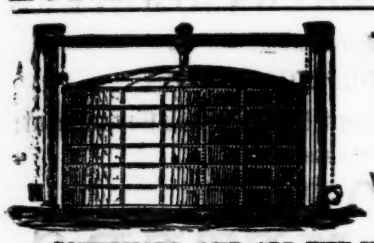

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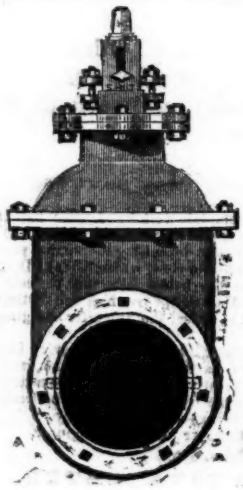
C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

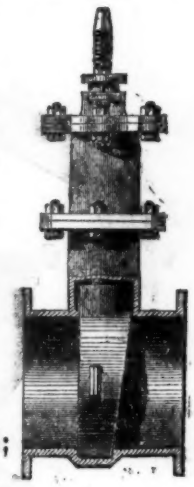
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



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For which Estimates will be given on application,

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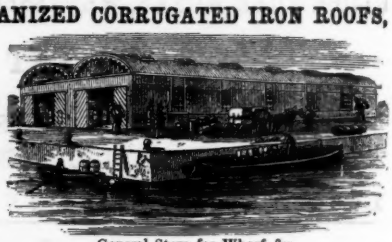
EITHER WITH

TIMBER FRAMING or WHOLLY in IRON.

Open Shed for Covering Large Areas.



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PATENT IMPROVED SEAL

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SAVES COAL, RETORTS, FUEL, LABOUR, TIME, SPACE, AND CAPITAL.

PREVENTS STOPPAGE OF ASCENSION-PIPES, DEPOSITION OF CARBON IN RETORTS, THICKENING OF TAR IN HYDRAULIC MAIN.

GIVES MORE GAS PER TON OF COAL, WITH HIGHER ILLUMINATING POWER, SATISFACTION, AND PROFIT TO SHAREHOLDERS AND MANAGERS.

IS STRONG, SIMPLE, EASILY FIXED AND WORKED, AND THOROUGHLY EFFICIENT AT ALL TIMES.

TESTIMONIAL.

Gas-Works, Guildford, Sept. 15, 1874.

GENTLEMEN,—The five retorts fitted with your Patent Moveable Seal for Dip-Pipes, on June 30, have been in constant use since that date, and have worked in a most satisfactory manner.

These Retorts are still quite clean and free from carbon, whilst others not so fitted, after being at work eight weeks, required scurfing, having a deposit of carbon 2 inches in thickness on the inside.

I also find a slight increase in the yield of gas per ton of coal carbonized, although your Patent Seals are fitted to but one-fifth of the Retorts now at work.

As your statements respecting your apparatus are fully confirmed by the results obtained in practical working, I should wish you at once to fix one to each of the ovens at these works, that I may obtain all possible advantage during the coming winter.

Yours truly,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street, E.C. JOS. SHAW, Manager.

MODELS MAY BE SEEN, AND INFORMATION OBTAINED, AT THE OFFICES, 28, GRACECHURCH STREET.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

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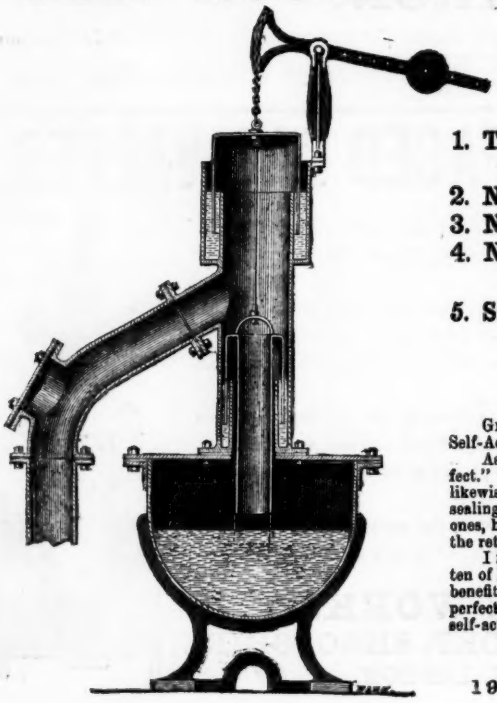

ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

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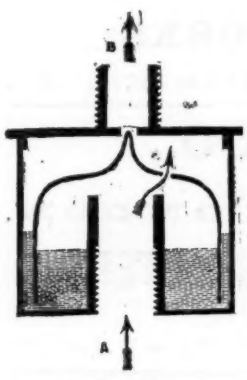

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The RHEOMETER is a new apparatus of measurement; it is entirely made of "metal," and works "inside a closed vessel."

It determines the quantity of gas to be consumed; and this quantity remains unchangeable, whichever be the burner employed, and whatever be the pressure.

ADVANTAGES.

For Domestic Purposes.—Saving of Gas.—Possibility of adopting low-pressure burners, which give as much as "four times more light" than the others, with the same volume.

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All Orders should mention what quantity per hour the Rheometer is intended to regulate.

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STREET-LAMP.
A great improvement on the old-fashioned 14-in. Lamps.
They have been sold to various Gas-Works throughout
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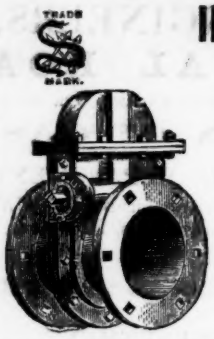
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List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.
These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.
VALVES MADE WITH OUTSIDE RACKS TO ORDER.
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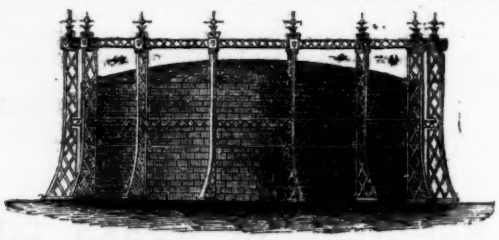
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In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—i.e., it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

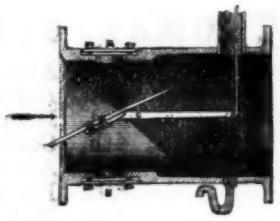
The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Company—two 36 in. at Blackfriars.
" " an 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Company—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "

The Exeter Gas-Works—a 24 in.
The Abergavenny Gas-Works—a 10 in.
The Birmingham Gaslight Company—an 8 in.
The Monmouth Gas-Works—an 8 in.
The Devonport Gas-Works—an 8 in.
The Cannes Gas-Works (France)—an 8 in.
The Mentone Gas-Works (France)—an 8 in.
The Rochdale Gas-Works—a 4 in.
The Imperial Gas Company, a 12 in at Great Cambridge Street.



TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE
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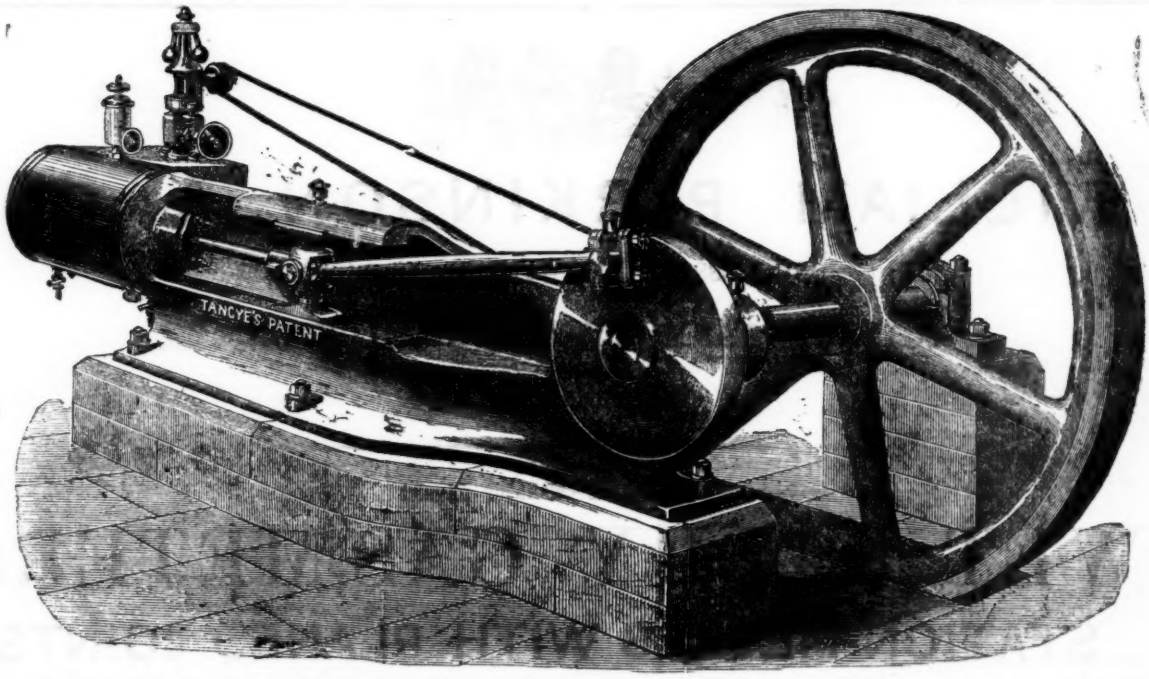

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact. The bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

Number	B	C	D	E	G	H	J	K	M
Nominal Horse Power .	2	3	4	6	8	10	14	18	25
Price of Engine . . .	£32	£38 15	£46	£70	£90	£115	£145	£185	£200
Feed Pump, extra . .	£3	£3 15	£4	£5 10	£6	£7 10	£8	£10	£15
Diam. of Steam Cylinder	4 in.	5 in.	6 in.	8 in.	9 in.	10 in.	12 in.	14 in.	16 in.
Length of Stroke . .	8 "	10 "	12 "	16 "	18 "	20 "	24 "	28 "	28 "

London 1851. New York, 1853 Paris, 1855. London, 1862.

Dublin, 1865.

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Paris, 1867.

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METERS FOR MEASURING WATER.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 2, 1875.

Circular to Gas Companies.

THERE would appear to be a feeling of uneasiness, on the part of some members of the Common Council of the City of London, as to what may be the result of the proceedings of their Gas Committee. So far, all the doings of the committee have been concealed from the "court," as the general body is named. If we remember rightly, no report has been made to the court, and, therefore, no authoritative sanction has ever been given to the agreement with the Metropolitan Board, for the promotion of the Purchase and Competing Bills we have already noticed. The third, or Regulation Bill, which is to be brought into the House of Commons as a public measure, is still in course of concoction, and we can only guess the provisions which are likely to be arranged by the joint committee of the Board and Corporation.

It would seem, however, to be the Purchase Bill which most alarms some members of the council, who wish that the Gas Committee should report immediately, "furnishing such informa-"tion and particulars as may be deemed necessary to assist in "forming a judgment upon its several provisions." The part which the Corporation are to play in this gas business is really so insignificant that we almost wonder that any Common Councilman should trouble himself about it. If the Bill should pass, the Corporation will have the option of making the City, as regards gas supply, a mere dependency of the Metropolitan Board; or they may buy some works, and all the gas plant in the City, from the Board, and supply within their own limits. At the present moment we do not see what the Corporation have to do with the Bill. Their interest only commences when the Metropolitan Board have purchased the undertakings.

When the Common Council come to discuss the provisions of the Bill, it may be as well if they bear in mind that it is certain not to pass in its present shape. The terms of purchase set forth in the Bill are such as the companies cannot agree to, and Parliament will not enforce. The only consideration which could be accepted would be that proposed by the Chartered Company, and agreed to by the Corporation of Birmingham, for the purchase of the Birmingham and Staffordshire Company—viz., the payment of perpetual annuities equal to maximum dividends. On these terms the companies may be bought up, but only on these, or the equivalent in hard cash.

What information and particulars the committee will furnish to aid the Council in forming a judgment, we must confess ourselves at a loss to imagine. They are always making certain complaints against the gas at present supplied, which the Bill they are assisting to promote will make legitimate conditions of supply. They complain of the burner used now in testing the gas, and the Bill adopts that identical burner. They have been incessantly complaining of "sulphur" in gas, and the Bill allows the amount of this impurity to be unlimited. They grumble at the present price of gas; but they are far too cunning to fix a maximum price. Gas is to be sold at the lowest rate "that the requirements of "this Act will permit;" in other words, the Metropolitan Board, or the Corporation, will be empowered to charge exactly what they like for it. Now, when these facts come to be laid before the Council, we have a strong suspicion that the shrewd common sense of some of the leading members will lead them to a belief that their position as gas consumers is not likely to be improved by a transfer of the works. And, as regards the City, there is this further to be urged. If they get possession of works at the only price possible, the Corporation may go on supplying gas at present rates. But no progress is possible. Outside the City—*i. e.*, in the area of the Metropolitan Board—the consumption of gas goes on increasing at the rate of 6 per cent. per annum, and, in the course of a few years, if no further disturbance in the coal market take place, the Board may find themselves in a position to reduce the price of gas. If, however, the City remain isolated—which we fervently hope will not be the case—the consumption of gas within the limits will probably decrease. Fewer residents and earlier closing hours will further reduce consumption, and no extension of trade will be possible. This is a consideration which ought to weigh with the Common Council. The Metropolitan undertakings will pay and pay well, even when bought at the proper price, if worked as a whole. But an isolated undertaking in a non-progressive district must necessarily be a failure—that is, if cheapness of supply be the test of success. So the Corporation will be reduced to the necessity of buying gas in bulk from the Metropolitan Board, and retailing it at a small profit—not a dignified occupation for the richest Corporation in the world. We shall look forward with much interest to the coming discussion in the Common Council; and, although we have no doubt that the Gas Committee will be fully supported in their proceedings, we shall be surprised if an intelligent minority do not strongly condemn them.

The Whitechapel District Board of Works have, as our readers will see in another column, resolved to petition against the Gas Purchase Bill of the Corporation of London and Metropolitan Board, one speaker denouncing the measure as a "stupendous "piece of impudence." Next week, probably, the neighbouring district of Mile End will follow with a unanimous vote in favour of the Bill. No one who knows the districts and the influences which preponderate in the Boards will be astonished at these contradictory resolutions, and all we have to say to those who may be concerned, and who do not know the east of London, is, that they should pay no attention to one or the other. There will presently be long discussions in all the metropolitan district boards and vestries, and the gross result, we have little doubt, will be the

assent of a majority to the purchase of the gas companies. Be it so, but let it be remembered that when the purchase is completed the real difficulties will begin.

These difficulties will presently require notice, but some of them were urged strongly at the Whitechapel Board meeting. The suggestion of the Bills is that the works should be managed by a committee of the Board, and we rather think it is understood that the chairman of this committee shall have a salary of £1000 a year. In what relation this gentleman, totally ignorant of gas manufacture, would stand to a chief engineer with a very much larger stipend, or what control he would possibly exercise, we must leave members of the Board to imagine.

The Vestry of St. Pancras are already rejoicing over their success in the management of the public lamps under the average meter system. The saving effected in the first quarter amounts to nearly £800, which leads sanguine vestrymen to hope that something like £3000 per annum will be saved to the parish.

We have to acknowledge the receipt of the annual report of the West of Scotland Association of Gas Managers, the members of which devote themselves to the compilation of statistics relative to the gas supply of Scotland. The present report contains a list of 249 undertakings, respecting most of which we have more or less information. When all the columns are filled up—as, we are bound to say, they are in many cases—we have a complete view of the undertakings. We are told what is the annual and maximum daily make, and the amount of leakage, the illuminating power, and the price. We have also measurements of several parts of apparatus, the areas of carbonizing and condensing surface, the capacity of condensers and scrubbers, the area of purifiers, and, as regards lime, the number of trays in use, and the total depth; and, lastly, the capacity of the holders. A glance over the particulars supplied shows that managers have not yet arrived at any fixed rules. We see in one case 16 trays, with a total depth of lime of 72 inches, for a maximum daily make of 120,000 feet; and in another 3 trays, with a total depth of 6 inches of lime, for a maximum daily make of 100,000 feet. The area of the purifiers in the first case is 400 superficial feet, in the second only 81 feet. In this latter case the purification would appear to be effected by washing or scrubbing, for the capacity of these vessels for the smaller daily make is three times what it is for the larger. The publication of these details makes us wish for more. We should like to know all about the gas made at Airdrie and Alloa. For the information of our southern readers, we may mention that the price of gas in Scotland ranges from 16s. to 4s. 2d. per 1000, and the quality from 35 to 17 candles. Leakage to the amount of 26 per cent. is confessed in one instance. The publication of these statistics is highly creditable to the association, and we hope they will in time succeed in persuading all managers to fill up the columns.

The New Gas Company does not appear to be prosperous. It was brought out, as our readers will remember, with a flourish of trumpets such as is seldom heard. The capital asked for was £250,000, of which £150,000 was to go to the "inventor," for, perhaps, the most worthless patent that ever passed the Great Seal. How much actual cash was netted we do not know, nor do we know what was really paid for a process now said to be a failure. All we learn is, that about £20,000 have been spent in demonstrating the failure of the patented process, and in making hopeful advances towards success.

The Association of Municipal Officers are, we rather think, kindly furnishing local authorities with drafts of a petition to the Home Secretary, begging him to introduce, on behalf of the Government, a general measure, which would have the effect of repealing most of the provisions of the Municipal Corporations (Borough Funds) Act. This, however, is not asked for in so many words. The petitioners, whoever they may be, are made to complain that they have no power to purchase gas-works or to erect new ones, and to assert that they "are desirous of protecting the ratepayers of the borough from a monopoly which "seriously affects their interests by the imposition of excessive "charges for gas supplied to them. . . . They respectfully "suggest that, under the circumstances, a Bill of a general character should be introduced by Her Majesty's Government "during next session, upon the principle of the Public Healths "and other Acts of Parliament, which might be adopted by any "local authority with the consent of the ratepayers of the district." It is not quite clear to us what is the actual nature of the measure desired, but we presume it would give Local Boards and Corporations power to start gas-works with the consent of a ratepayers meeting. We have no fear that the Home Secretary will pay attention to a memorial of this kind. He is shrewd enough to see that the competition in gas-making here proposed can only end in adding to, instead of relieving, rates. The sample petition we refer to, has been adopted by the Dover Corporation, who thereby give currency to statements which are manifestly unjust to the Dover Gas Company.

Water and Sanitary Notes.

We are able to publish to-day the answers of three of the metropolitan water companies to the letter of the Metropolitan Board we referred to last week. The reply of the West Middlesex Company is a complete exculpation, so far as they are concerned. They have done everything in their power to ensure the immediate attendance of a turncock in case of fire, and their arrangements have worked so well that, in 40 out of 62 cases, the turncock has been on the spot before the engines. The suggestion made to the Board, that a turncock should reside at every fire brigade station (for whom the company offered to pay rent), ought at once to have been adopted, but the Board rejected the proposal. In this company's district, it is to be observed that, there are 67 miles of mains constantly charged; but the Board have never put up a hydrant.

The reply of the East London Company is more lengthy and sarcastic—not to say savage. But such a reply was well deserved. This company have, within the metropolis, 70 miles of mains constantly charged under high pressure. "On these mains "there are neither fire-plugs nor hydrants; no plugs, because "they would be driven out by the pressure; no hydrants, the "Metropolitan Board of Works knows why;" and the directors go on to say that "it should be made generally known to whose "neglect it should be attributed that the public are to so great "an extent, in this company's district, deprived of proper safe-"guards against fire."

The answer of the New River Company is equally condemnatory of the Board. The company have 218 miles of mains constantly charged under pressure, "but the power of fire extinction thus at "command in these or in any other pipes, can only be made available "by *the substitution of hydrants for plugs*." The complaint of the Metropolitan Board received a wide circulation, and, while perhaps not intending it, created a strong feeling against the water companies. We, therefore, feel it but just to give the widest possible circulation to these crushing replies, which will, we hope, stir the Board to action. The money they will spend this year in fighting the gas companies to no purpose, we expect, would suffice to furnish a considerable district with hydrants.

The ratepayers of Leicester seem very anxious to get possession of the water company. Why, it is hard to say. The Corporation hold a large number of shares, and last year received £3680 out of the profits. The capital of the company is £200,000, and the present value is estimated at £336,000, but the whole cost of the purchase is calculated at £400,000, at which price the Corporation would make a very good bargain. We have no knowledge of the views of the directors on the matter, but shall probably learn them before the Bill which they are promoting comes before a committee.

The Corporation of Barrow-in-Furness are promoting a Bill, which, if passed, will give them a most complete control over the sanitary arrangements of their district. As regards new houses, everything, from cellar to roof, is to be done "subject to the ap-"proval of the Corporation," who are to have control over the materials and the workmanship, and may reject or disapprove of such materials or workmanship, if the adoption or continuance of the same is, in their opinion, likely to prove prejudicial to the stability of such buildings, or to the health of the inhabitants thereof. We have no doubt this is all right, but we cannot help thinking that the free-born Englishman, who once had a right to do as he liked with his own, and whose "house was his castle," is being rapidly extinguished by Corporations and Local Boards. If any man has made a speculation in building land at Barrow, and desires to make the most of it, he will be sadly disgusted when he reads this Bill, and finds that 150 square feet of open space must be left about every one or two storeyed house. In the case of a common lodging-house or hotel, it is further provided that the ventilation space shall be increased by an additional ten superficial feet for every person the house is intended to accommodate. Every room in a house is to be provided with the means of efficient ventilation, the sizes of the windows being prescribed according to the area of the floor. Small apartments, without fire-places, are to be provided with ventilating shafts. We think the Corporation might go a step further, and make it penal to stuff a bag of straw into such a shaft, or to put a chimney-board before a bed-room fire-place. The old proverb says that you may lead a horse to water, but you cannot make him drink. So you may provide for any amount of ventilation in a house, and you will find the inhabitants closing every cranny that will admit air; and some people tell us they are right, for that warm air is of more consequence to us than fresh air. No one may "live" over a stable in Barrow, and if any one should try the old German cure for consumption, by sleeping over a cow-house, he may have to pay 20s. a day for the luxury. We do not know that there is anything specially objectionable in these proposals, but we quote them to show how "grandmotherly government" is progressing.

THE GAS BILLS FOR 1875.

THREE special Bills are promoted by Corporations for the purchase of existing gas undertakings.

The *Metropolis Gas Undertakings Purchase Bill*—the leading provisions, at least, have been noticed before, but they may now be briefly recapitulated. The terms of purchase, so far as regards the 14 companies whose limits lie wholly within the district of the Metropolitan Board of Works, are the payment of a sum equal to the market value of the share capital issued on or before Oct. 1, 1874, estimated on the average of the three preceding years, with a sum to be agreed upon in respect of capital issued subsequent to the above-mentioned date, but anterior to the notice of purchase, which, it should be mentioned, must be given within a year of the passing of the Act. As regards the two companies whose limits are not entirely within the district of the Board, the terms are to be settled by agreement or arbitration. The Metropolitan Board propose to supply 16-candle gas at the lowest possible price, and, as regards purity, the gas is to be in all respects in accordance with the provisions of the Gas-Works Clauses Act, 1871. The Board ask power to supply gas in bulk to the Corporation of London, that body obtaining power to purchase all the gas plant within the City; or the Corporation may buy some particular works, and supply their district. The other provisions of this Bill have been sufficiently noticed (*ante*, vol. xxiv., p. 789).

The *Barton, Eccles, Winton, and Monton Local Board of Health Gas Bill* appears to be promoted to effect a compulsory purchase of the mains belonging to the Corporation of Salford, which now distribute gas to the Barton district, and to enable the Local Board to construct works for the supply of the district. Probably some agreement has been made between the two authorities, but no terms are mentioned in this Bill. The Board propose to supply 14-candle gas at a price not exceeding 4s. 6d. per 1000 feet. The test-burner is to be a 15-hole Argand, with 7-inch chimney. The Board ask power to borrow £10,000 for the purposes of the Bill, and propose to apply surplus profits for the public benefit of the inhabitants.

The *Birmingham Corporation Gas Bill* has already been fully noticed; but the terms of purchase agreed upon may be shortly recapitulated. First, as regards the Old Birmingham Company, whose paid-up capital is said, in their Amalgamation Bill, noticed last week, to be £299,980. For this the Corporation of Birmingham have agreed to pay £450,000, or, failing the payment of the gross sum, an annual rent of £22,500. In the case of the Birmingham and Staffordshire Company, whose paid-up capital amounts to £645,400, the Corporation agree to pay annuities equal to maximum dividends on the sum just mentioned, £320,400 of which is entitled to 10 per cent., and the remainder to 7½ per cent. The purchase does not include the reserve-fund of the Birmingham and Staffordshire Company. The Corporation propose to supply 14-candle gas, tested by an Argand burner, with 15 holes and a 7-inch chimney, at a price which, it is understood, is not to exceed 4s. per 1000 feet. No price is, however, fixed in this Bill.

The *Southampton Corporation Gas Bill* is, as our readers know, promoted by the Corporation to obtain possession of the undertaking of the Southampton Gas Company, on terms to be settled by agreement or arbitration. As said in last week's "Circular," it is probable that terms have been agreed upon. The Corporation ask power to borrow as much money as may be needed for the purchase, and £50,000 more, all of which they propose to pay off by means of a sinking-fund of 60 years. They have a modest idea of a "depreciation-fund," as they design to set apart only £100 a year, until an aggregate sum of £5000 has been accumulated. The Corporation propose to supply 14-candle gas, tested by Sugg's new "London" burner, at a maximum price of 5s. per 1000 feet within the borough, and 6s. beyond. Section 35 of the Bill should, we rather think, receive the attention of the ratepayers, since, in case the gas undertaking should not be remunerative in the hands of the Corporation, it will allow any amount of taxation to cover the losses caused, it may be, by mismanagement.

There were two Bills promoted by local authorities to obtain power to set up competing works. Of these, the *Metropolis Gas (New Works) Bill* has been sufficiently noticed; and the *Southampton Bill*, as our readers were informed last week, has been dropped.

Only one Bill is promoted by a new company to obtain statutory powers for the supply of gas and water. The *Millom Gas and Water Bill* is to incorporate a company, with a capital of £30,000, to the sanitary district of Millom Below and Chapel Sucken, in the county of Cumberland. It is proposed to supply 14-candle gas, tested by a 15-hole Argand burner, &c., at a price not exceeding 6s. per 1000 feet. The water is to be obtained by impounding a stream called the Whicham Beck, and is to be distributed by gravitation. The rates are to be those now usually fixed, and are to be paid quarterly in advance. The Bill provides that the Local Board may at any time acquire the undertakings on payment of a sum equal to the amount of capital expended, with interest at the rate of 7 per cent. from the time the money was disbursed, less any profits divided in the meantime. It is proposed to raise the capital in £10 shares, but it is provided that they may be divided in half shares, preferred and deferred. The Bill is to give the Local Board power to borrow £60,000 for the purchase and carrying on of the undertakings. For the rest, all the usual powers of a gas and water company will be conferred if the Bill should pass.

Seven Bills are promoted by local authorities to obtain various powers, and among them authority to purchase gas undertakings, and to acquire or extend water-works.

The *Ashton-in-Makerfield Local Board Bill* is to authorize the purchase of the Consumers Gas Company, Limited, under an agreement already made, for the sum of £6928, the stock-in-trade being taken over at invoiced prices. The Board propose to supply 16-candle gas at a price not exceeding 6s. 8d. per 1000 feet, with discount at the rate of 10 or 20 per cent., according to consumption, on prompt payment of accounts. The district has at present no general supply of water, which the Board now propose to furnish. The rates for water are to be about as usual, and, as usual in the case of local authorities, stringent powers are applied for. Authority is sought to borrow £12,000 for gas, and £25,000 for water purposes.

The *Ballina Improvement Bill* is to confer a variety of powers on the Town Commissioners, and among them to authorize the purchase of the gas undertaking belonging to Hanna, Donald, and Wilson, on terms to be settled by agreement or arbitration. The commissioners propose to supply gas at a price not exceeding 7s. 6d. per 1000 feet. Power is also sought to construct water-works for the supply of the town and parish of Kilmoremoy. It is proposed to borrow £6000 for water-works and £4500 for gas-works. The Bill, if passed, will give the commissioners all the usual powers of a gas company; and, as regards water supply, we may mention that regulations set forth in a schedule are of the most stringent character.

The *Cardiff Improvement Bill* is to extend the limits of the borough of Cardiff, and empower the Corporation to make improvements. Among the powers sought is authority to purchase the local gas and water undertakings. No terms appear to have been agreed upon between the companies and the Corporation, and all that the Bill says about the consideration is that it shall be "a gross sum or a yearly rental, fixed or fluctuating," or anything else that may be agreed upon. Supposing the Corporation to get the gas undertaking, they propose to supply 14-candle gas, tested by the new "London" burner, but no maximum price is mentioned in the Bill. As regards water supply, all the ordinary powers to make regulations, &c., are applied for. For gas purposes, power is sought to borrow £160,000, and for water £200,000.

The Commissioners of Police of the Royal burgh of Inverness are promoting two Bills, one of which is to give them authority to purchase the undertakings of the Inverness Gas and Water Company, and the other is to authorize them to set up rival works. It may be presumed that no terms of purchase have yet been arranged. The sums which the commissioners propose to borrow are £12,000 for the water-works and £17,000 for the gas-works. It is proposed to supply 20-candle gas, tested by a union jet burner, at a price not exceeding 8s. 4d. per 1000 feet. As regards both gas and water, the commissioners ask the usual powers. With respect to surplus profits, we notice that the excellent Scottish system is to be followed, and that they are to be applied in reduction of price.

A very short notice of the Bill to authorize competing works will suffice. For water-works, the commissioners seek power to raise £30,000, and for gas-works £12,000—a waste of money which we do not expect Parliament will sanction. The other provisions of the Bill resemble those in the Purchase Bill just mentioned.

The *Pontefract Borough Extension Bill* is intended, as the title implies, to extend the boundaries of the borough, and also to authorize the transfer to the Corporation of water-works now belonging to Street Commissioners, and to empower the Corporation to purchase the undertaking of the Pontefract Gas Company, the consideration being a gross sum or annuities, as agreed upon. Power is asked to borrow £40,000 for the purposes of this Act. From the date of transfer, all the powers granted to the gas company by their Act of 1873 are to be transferred to the Corporation.

The *Waterford Improvement Bill* is, for one thing, to authorize the Corporation of the city to purchase the undertaking of the Waterford Gas Company, with a view, says the preamble, to supply of gas of better quality, and at a more moderate price. The gas of better quality is to give the light of 12 candles, tested by Sugg's "London" Argand, and the more moderate price is

not to exceed 5s. 6d. per 1000. It does not appear that any arrangement has been made between the company and the Corporation, for no consideration is set forth in the Bill. Power is, however, asked to borrow £30,000 "with reference to gas purchase and gas supply." The Bill is to make sundry amendments of no great interest in the Water-Works Act of the Corporation.

The following are Bills by which local authorities seek further powers in respect of gas and water undertakings:—

The *Barrow-in-Furness Corporation Bill* is to extend the municipal limits, and authorize the Corporation to enlarge their gas and water undertakings. For these purposes they propose to borrow £60,000 for water-works, and £15,000 for gas-works. Some other provisions of the Bill will be noticed in another column.

The *Bradford Water-Works and Improvement Bill* is to give the Corporation power to construct additional water-works and new gas-works, authority being prayed for the sale of the site of the disused works. The Bill proposes that the illuminating power of the gas shall be 15 candles, as tested by a 15-hole Argand burner, &c. The amount the Corporation propose to borrow for water-works is £300,000, and for the new gas-works £200,000.

The *Hindley Local Board Bill* is to give the Board power to charge an increased price for gas, because of the advanced cost of coal and labour. The maximum price now proposed is 5s. 3d. per 1000 feet. Power is also sought to take land and construct new gas-works, for which the Board desire to borrow £30,000. As regards water-works, the Board seek for an extension of time for the purchase of land and the completion of works.

The *Rochdale Improvement Bill* is to enable the Corporation to expend an additional sum of £200,000 on water-works, and to extend the time for the compulsory purchase of lands for gas and water works. Power is also sought to defer the commencement of the sinking-fund destined to repay the money borrowed for gas and water works until Jan. 1, 1885.

The *Widnes Local Board Bill* seeks power to extend the gas and water limits of the Board, and also to supply gas and water beyond those limits, provided it can be done without prejudice to a full supply for the inhabitants within the district. For gas purposes, the Board ask power to borrow £30,000, and for water-works £70,000, which they propose to pay off by means of a sinking-fund within 60 years.

There are six applications to the Board of Trade, from gas companies, for Provisional Orders under the Gas and Water Works Facilities Act.

The *Blackburn Gas Order* is simply to empower the Blackburn Gaslight Company to raise additional capital to the amount of £180,000, and to borrow, on the usual conditions, £45,000.

The *Brighton and Hove Gas Order* is to empower the Brighton and Hove General Gas Company to raise £50,000 of capital, and to borrow £12,500. The dividend on the new capital is limited to 7 per cent. or 6 per cent., according as it is issued in preference or ordinary shares.

The *Godalming Gas Order* is, in effect, to give the Godalming Gas Company, Limited, statutory powers for the supply of gas over a rather extensive area. The original capital of the company is only £15,000, and the additional is only £5000, so we may take it that it is not the intention to supply immediately Puttenham on the one side, and Witley on the other. The price of gas is not to exceed 6s. 6d. per 1000; but the company ask power to make a difference of price not exceeding 6d. in parts of their limits. The gas supplied is to have the illuminating power tested by Sugg's new "London" Argand, No. 1, and the night and day pressures are to be as usual.

The *Littlehampton Gas Order* will, if and when confirmed, give statutory authority to the Littlehampton Gas Company, Limited, for the supply of gas to Littlehampton and the vicinity. The share capital is not to exceed £16,000 without further authority. The gas supplied is to have the illuminating power of 12 candles; and the price is not to exceed 7s. per 1000 feet within the district of the Local Board of Health, nor 8s. beyond.

The *North Bierley Gas Order* is to empower the North Bierley Gas Company to raise £71,000 additional capital, with the usual borrowing power. The dividends on this new capital are limited to 7 per cent., or 6 per cent., according as it is preference or ordinary. Gas of 14-candle power is to be supplied, and tested by Sugg's new "London" Argand, No. 1.

The *Weymouth Gas Order* is to authorize the Weymouth Gas Consumers Company to raise additional capital to the amount of £10,000, the dividend on which the draft order proposes shall not exceed 10 per cent. The new capital is to carry the usual borrowing power.

The *Wolverhampton Gas Order* is to empower the Wolverhampton Gas Company to raise further capital to the extent of £49,480, with the usual borrowing power. The dividends payable on this new capital are limited to 7 per cent. or 6 per cent., as is now customary.

There is one application from a combined gas and water company. The *Bridgend Gas and Water Order* is to empower the Bridgend (Glamorganshire) Gas and Water Company to raise £29,000 additional capital, and to borrow to the usual extent. The dividend on this new capital is limited, as in the case just mentioned.

The Orders applied for by water companies are as follows:—

The *Bognor Water Order*, which is simply to amend an order obtained by the Bognor Water Company in 1871. It will make the capital of the company £10,000 instead of £5000, and authorize works in substitution for those described in the order previously obtained.

The *Maidenhead Water Order* is to give authority to a new company, called the Maidenhead Local Water-Works Company, Limited, to supply Maidenhead, Cookham, and Bray. A well is proposed as the source of the water. The capital of the company is not to exceed £8000. As regards charges, some unusual provisions are introduced. A head of cattle consuming water may be charged for at the rate of 4s. a year; every horse, 10s. a year; every carriage, 10s. a year; gardens watered in the usual way with a watering-pot, we suppose, may be charged for at the rate of 6s. a rood, or fraction of a rood; and gardens watered with a hose may be charged for at the rate of 1s. for every 100 square yards. For the rest, the charges and general provisions are much as usual. The water supplied is to be as pure as the source and nature of supply will admit, and if on any day it be of less purity than it ought to be, according to the foregoing provision, the company may be fined £10.

The *Newington Water Company, Limited, Order* is to give statutory authority. The undertaking was started in 1873 by Mr. Garbutt, who obtained a concession from the Local Board for the exclusive supply of the Newington district for 21 years. Last year a limited company was formed, who, by agreement with the Local Board of Cottingham, obtained an extended district. This order proposes to add other neighbouring parishes, and give the company full powers of supply over the whole area, the local authorities having power to purchase the undertaking at the expiration of the 21 years. No capital is applied for.

The *Newport Isle of Wight Water Order* is to give ordinary powers to the Newport (Carisbrooke) Water Company, the capital of which is limited to £10,000.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XLVIX.

The Chemistry of Lime and Oxide Purification.

Before we close the subject of the chemical changes which take place during the purification of crude gas, it will be as well to touch on a few points which, for the sake of simplicity, have been previously omitted, but which should now receive some attention. It will be remembered that, when speaking of the composition of gas liquor, it was pointed out that sulphocyanide of ammonium was one of its invariable constituents. This substance—viz., the sulphocyanide of ammonium—is not only always present in gas liquor, but is likewise found in minor quantity in all the bye-products of a gas-works. It is found in the liquid from the hydraulic main, the condenser, and the scrubber, and is likewise present in spent oxide and in foul lime, the former of these—viz., the oxide—likewise containing a considerable proportion of prussian blue, which substance is a ferrocyanide of iron. As the cyanogen compounds are thus so widely diffused, it is proposed to point out as shortly as possible in what manner they are formed in the ordinary method of gas manufacture. In connexion with gas liquor, it is also proposed to call attention to a patent taken out some years ago by Mr. John Leigh for purifying gas, and to compare it with the more recently patented process of Mr. Hills, which has already been discussed. Finally, on the subject of oxide of iron, a few words will be said with reference to Mr. Fish's method of revivifying spent oxide *in situ*.

Commencing with cyanogen and its compounds, this substance is formed during the destructive distillation of the coal, and is a compound of nitrogen and carbon, being represented by the formula NC_2. The greater part of the nitrogen contained in the original coal assumes the form of ammonia, by uniting with the hydrogen also present; but a small proportion of the nitrogen unites with two equivalents of carbon to form cyanogen. The cyanogen does not, however, remain in its original form, but, coming in contact with sulphide of ammonium, unites with that substance to form the sulphocyanide of ammonium, in which form nearly the whole of the cyanogen is subsequently found. According to Dr. Odling, sulphocyanide of ammonium is likewise formed in another way. In his lecture before the British Association of Gas Managers, on "Bisulphide of Carbon," he stated that in the presence of an excess of ammonia the sulphocarbonate of ammonium—a substance which, it will be remembered, is formed from the union of sulphide of ammonium and bisulphide of carbon—becomes converted into sulphocyanide. The greater part of the sulphocyanogen is removed from the gas in the condensers and the scrubbers, but a portion of this

substance is carried forward with the gas, and is removed by the lime and oxide used for purification. Even here the removal is not absolute, for the water in the gasholder-tank and in every wet meter will generally give indications of the presence of sulphocyanides, proving that the purified gas, on its entering the holder, and even after, still retains a perceptible quantity of these compounds. The explanation of the presence of such a comparatively large quantity of prussian blue in the spent oxide is by no means clear, and it is, in fact, almost impossible, with our present knowledge, to account satisfactorily for its formation.

With regard to Leigh's patent for purifying coal gas, the chief point in his invention is the treatment of ordinary gas liquor, so as to enable it to be used for the purification of gas, and more especially with a view of removing bisulphide of carbon. Mr. Leigh's method is in use at the Manchester works, where the sulphur averages no more than about 8 grains per 100 cubic feet. In his patent of 1866 he claims the treatment of gas liquor with caustic lime, whereby carbonic acid is removed, and the liquor thus rendered again suitable for use in the purification of the crude gas. He also claims the treatment of the liquor with foul lime, the sulphide of calcium in which acts on the carbonate of ammonia present in the following manner:—

$$NH_4O, CO_2 + CaS = NH_4S + CaO, CO_2,$$

in which carbonate of lime is formed, and the ammonia previously existing in combination with carbonic acid converted into sulphide, and is then used for absorbing bisulphide of carbon.

Another of Mr. Leigh's plans for treating gas liquor is to concentrate it by distillation. He heats the liquor in suitable boilers, and passes the evolved vapours through "foul lime," also preferably heated, and from thence to a condensing apparatus. The application of heat to the liquor causes the evolution of carbonate and sulphide of ammonium, the former of which becomes converted into sulphide by passing through the foul lime, which retains the carbonic acid, and yields up an equivalent of sulphuretted hydrogen. The final result from the subsequent condensation of the evolved products is, therefore, a concentrated solution of sulphide of ammonium. In place of using this condensed liquid in a scrubber or a washer for removing bisulphide of carbon, Mr. Leigh sometimes prefers to conduct the evolved vapours at once to the condenser, without previous condensation, and there allow the sulphide of ammonium, in the vaporous condition, to act on the crude gas.

The methods of Mr. Leigh and Mr. Hills attain like results, only differing somewhat in the means employed. They both endeavour to render the gas liquor again suitable for use; but while Mr. Hills appears to aim more at its entire purification, by the separation and expulsion of sulphuretted hydrogen and carbonic acid alike, Mr. Leigh's object is more that of economically producing a concentrated solution of sulphide of ammonium, for the special purpose of removing bisulphide of carbon. From what has been previously remarked, when discussing Mr. Patterson's method of treating and using gas liquor, the reader will scarcely fail to see that, however much the liquor is concentrated, or whatever the proportion of sulphide of ammonium which it contains, that it is alike incapable of dealing with bisulphide of carbon, *unless used in a special way*. Mr. Leigh seems, in his patent, to specially aim at the production of sulphide of ammonium, and the removal of the bisulphide impurity; but he does not in any way mention any special way in which the sulphide should be made use of when prepared, beyond the mere statement of its use in an ordinary washer or scrubber. It is obvious that, if no precaution were adopted for the previous removal of carbonic acid, the sole result would be that this substance would react on the sulphide of ammonium and decompose it, while the bisulphide of carbon would remain unaffected. This would certainly be likewise the only effect of bringing sulphide of ammonium in the vaporous state in contact with the crude gas in the condenser. As Mr. Leigh's processes are used with success at Manchester, the sulphides are probably used in a systematic way, since by no other means could the amount of "sulphur" be so low. We shall now, finally, touch upon Mr. Fish's method of revivifying spent oxide.

By this gentleman's plan, the oxide is revivified without being removed from the purifier, so that much labour is by this means saved. When the oxide has become "foul," he shuts off the gas, and opens communication with the external air, at the same time that a jet of steam is blown into the purifier in such a way that air is drawn in, and forced through the spent oxide. The air effects the complete revivification of the contents of a purifier of ordinary size in about four hours. The presence of the steam prevents the excessive elevation of temperature which would otherwise occur, and acts by moderating the chemical action which takes place.

An equation, representing the revivification of oxide by exposure to air, has already been given in the discussion on oxide purification, and as the reaction which takes place by Mr. Fish's method is exactly the same, no further explanation is needed.

It only remains to be added that his process possesses considerable merit, and that it is worthy of more extensive adoption.

(*To be continued.*)

Bristol Public Lighting.—At the last weekly meeting of the Committee of the Bristol Sanitary Authority, Mr. Kitt, the city gas inspector, reported that a large number of public lamps were found to be extinguished during the previous week, and they were reported by the gas company to have been blown out by the high winds. He further reported that six dry gas-meters had been affixed to a similar number of public lamps in Broadmead, College Green, top of Park Street, Stoke's Croft Road, Cheltenham Road, and Newfoundland Street. Great care had been taken to secure meters from the best makers, in connecting them with the lamps, and in taking the registrations. The result of the tests showed that the average consumption of gas was 4·84 cubic feet per hour.

Correspondence.

THE GASLIGHT AND COKE COMPANY'S INCREASED CONSUMPTION IN 1874.

Sir,—In Mr. Beck's speech to the Chartered Gas Company's shareholders on the 22nd inst., he incidentally mentioned that the increase in the supply of gas by his company in 1874 had been—

	Per Cent.
1. March quarter	5½
2. June ditto	7
3. September ditto	8½
4. December ditto	9½

"The total average increase for the year being 6½ per cent." On referring to what I stated in evidence before the Chartered Revision Commissioners in March last upon this point, I find that your own report of it is (p. 443):—

"With regard to the increase in the consumption which the company anticipate in the sale in 1874 over 1873, I believe the proper rate would be 5·73 per cent. I do not found that estimate upon the actual gas sold during the last two preceding years, because I do not think that quite reliable. There have been disturbing influences, and therefore I have gone back towards the former years, and have taken the annual rate of increase. My data is from 1866, and I have taken that data in order that there should be no difficulty in the subject, as it is based upon a return made by the company at the request of a parliamentary committee. The annual rate of increase from 1866 to 1872 was 5 per cent.; but I agree with the view submitted by Mr. Field, that the strike made a considerable difference, and that the consumption of gas would have been larger had it not occurred. The consequence is that that modifies the annual rate of increase considerably; and adopting the figures of 3,862,487,000 cubic feet, there is no doubt the whole rate of increase is correctly 5·35 per cent. For the Imperial Company, which has not been subject to disturbing influences, the annual rate of increase has been 5·77 per cent. The actual figure of the Chartered Company for the last year was a little less than 4·72 per cent. *I look forward to an increase of 5·73 per cent. in* 1874 *with great confidence.* If a considerable increase in price is made, it would no doubt affect it, but I cannot speculate to what extent."

Now the reference which the commissioners—Dr. Odling, Mr. Reilly, and Mr. Pattison—made, in their award, to this subject stated that—

"It was contended for the consumers that the increase should be estimated at 6 per cent. at least; but we do not think that sufficient evidence was adduced to support that view."

They estimated it, consequently, at 2½ per cent. Mr. Field, for the Chartered Company, had taken it at 1½ per cent.

No one, of course, could lay a claim to infallibility upon such a question; but, accepting Mr. Beck's statement as correct—and there appears no reason to doubt it—I certainly feel gratified to find that, while so entirely at variance with undoubted authorities, still I had not overstated the actual rate of increase which I calculated upon for 1874 in this instance.

The question is of no moment, except as bearing upon the value of calculated annual rates of increase; it is completely devoid of any reference to "gas politics," which allows of my taking the liberty of asking for the insertion of my letter in your estimable Journal.

Arthur Silverthorne.

1, *Westminster Chambers, Victoria Street, S.W., Jan.* 28, 1875.

GAS IMPURITIES AND PURIFICATION.

Sir,—The perusal of Mr. Patterson's letter, in your last number, on "Gas Impurities and Purification," induces me to trespass on the space in your valuable Journal for the purpose of explaining the scrubbers I have used for some years, and which I described at the Dublin Meeting of the British Association of Gas Managers in 1871 as "two scrubbers with liquor, and a third with water."

After reducing the temperature of the gas to between a minimum of 50° and a maximum of 60° Fahr., it is passed up through scrubbers, entering by a perforated box at bottom, and rising through narrow spaces between rough sawn thin boards, as used by Mr. Livesey.

At the top and at foot of each scrubber there are tanks, with steam-pumps having variable strokes.

The liquor used in No. 1 scrubber is worked up to 6° Baumé, sp. gr. 1041—say, 16 ounces. In No. 2, it is worked up to 2° Baumé, sp. gr. 1013—say, 5 ounces; and in these two scrubbers the gas is rather washed than scrubbed, as it is thoroughly drenched with the liquor, the latter being admitted in volume from two pipes, and discharged on dash-plates and a coarse cocoa-nut fibre.

In No. 3 scrubber water only is used—not more than 6 gallons to the ton of coal carbonized.

The houses in which the condensers and scrubbers are fixed are always respectively at uniform temperatures, and the gas issues from the scrubbers at the same temperature as it entered them. The same care as to temperature is observed in the lime and the oxide purifiers, which are always in a house.

About 30 years ago I first saw naphthaline in a gas-work—it was at the Royal Mint, in a condenser exposed to the mid-day sun. As iron retorts were used, very high heats were not the cause; neither do I believe that where an abnormal quantity of bisulphide of carbon exists in gas that it is the consequence of high heats, but rather is caused by the use of wet coal, unequal heats in different retorts of a setting, and later combinations in the purification.

I have had occasion to note, when visiting both large and small gas-works, the great variations of temperature in the different apparatus, which must exert a most pernicious influence on the purification.

Apparatus is frequently exposed to sun and frost indifferently, and is too often insufficient in size for the heavy winter's work. I ask, is it reasonable to attempt to carry on so delicate a process as the purification of coal gas under such circumstances?

Of course, when gas is once delivered into the gasholder, it takes the temperature of the atmosphere, and this is again changed when it enters into the mains. This cannot be avoided; but variations in temperature during the purification can and ought to be avoided.

25, *Old Broad Street, London, E.C.*, Hodgson Jones.
Jan. 28, 1875.

METER-INDEXES.

SIR,—Perhaps some of your many readers will be able to inform me if there is such a practice, among meter inspectors or gas companies book-keepers, as that of putting in the books to the true index of the meter, as found on a certain day, the progressive figure or figures, and, as I am but a learner, they may, by your next issue, tell me if it helps them to give the consumption, or what advantage it is at all; and if meter-indexes are not made right, when it is necessary to put the supposed figure down, to show what had gone through the meter. Thus, a three-dial meter would, in October last, stand 98,600, and in January, 1875, at 01,200. I am, by the system adopted by our works, made to put down the 1, and show the meter standing at 101,200, and it goes on till I get two supposed figures, as 2,302,200 in my books on same dial, in place of 02,200; and I am thinking, if this goes on much longer, the indexes in my district will mostly be all supposed figures, and, if possible, I would like to give the true state of index, as I see the true consumption can be given without adding any figures, or falsifying the index. A reply from those who have or have not this system, explaining its advantages or disadvantages, would greatly assist

Jan. 23, 1875. A COUNTRY GAS MANAGER.

VARIATIONS IN THE REGISTRATION OF DRY-METERS.

SIR,—On experimenting recently with some dry meters, I found that, although the majority of them were correct when consuming the maximum quantity of gas for which they were constructed, yet, when this was exceeded, there was considerable variation in the registration, and always against the gas company.

Thus, with a 3-light meter, burning 15 feet per hour, the indication was about correct, but on adding another burner, so that the consumption was increased to 20 feet, then the average registration was 5 per cent. slow, and on further increasing this to 25 feet, the variation was equal to 12 per cent. Can any of your readers explain this?

I may observe that some of the meters tried were not susceptible of this variation.

Feb. 1, 1875. NEMO.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1875.

MONDAY, JAN. 25.

The following unopposed petitions for bills passed Standing Orders:—

- Portishead District Water.
- Tunbridge Wells Gas.
- Market Rasen Water.
- Birmingham and Staffordshire Gas.

TUESDAY, JAN. 26.

The following unopposed petitions for bills passed Standing Orders:—

- Longton Gas.
- Kilmarnock Water.
- Hamilton Water-Works.
- Barton, Eccles, Winton, and Monton Local Board of Health.
- Busby Water.
- Worthing Gas.
- Broadstairs Gas.
- Leicester Water.
- Galashiels Water.

WEDNESDAY, JAN. 27.

The following unopposed petitions for bills passed Standing Orders:—

- Great Grimsby Gas.
- Cleethorpes Gas.
- Truro Water.
- Marlborough Gas.
- Southampton Corporation Gas (Purchase of Existing Works).

THURSDAY, JAN. 28.

The following unopposed petitions for bills passed Standing Orders:—

- Alford Gas.
- Millom Gas and Water.
- Stafford District Water.
- Stockton and Middlesbrough Water-[Works.
- Eastbourne Water.
- Hindley Local Board.

The memorial against the Pemberton Local Board Bill was withdrawn, and the petition endorsed for due compliance.

FRIDAY, JAN. 29.

The following unopposed petitions for bills passed Standing Orders:—

- British Gas Co. (Norwich Station).
- Waterford Improvement.
- Newport (Mon.) Gas.
- Wakefield Water.
- Rotherham Corporation.
- Imperial Gas.
- Broadstairs Water (No. 2).
- Commercial Gas.

In the opposed case of the Ballina Improvement the Standing Orders were not complied with.

ASSOCIATION OF SANITARY INSPECTORS IN SCOTLAND.—On Wednesday last a meeting of sanitary inspectors in burghs within a radius of 50 miles of Stirling was held in the Council Chambers, Stirling. The chief objects of the association are the mutual consideration of subjects connected with sanitary matters, the diffusion of information which will lead to an increased knowledge of the laws of health and of sanitary science generally, the establishment of a proper system of co-operation and communication between sanitary officials throughout Scotland, and the affording of cordial aid to each other by members in all matters pertaining to the discharge of the important duties of the office of a sanitary inspecter. Mr. Welsh, of Perth occupied the chair, and Mr. Macleod, Glasgow, moved the first resolution, which embodied the rules of the society. On the motion of Mr. Watson, Hamilton, it was then resolved:—"That the sanitary inspectors who have, as reported by interim secretary, signified their approval of the establishment of the association, shall be and hereby are constituted members thereof, and those present do now resolve themselves into the first meeting of the association." It was also agreed.—"That the first annual meeting shall be at Stirling, on the first Wednesday of June."

HUNTINGDON GAS SUPPLY.—A special meeting of the Huntingdon Town Council was held on the 21st ult.—the Mayor (Mr. Bull) in the chair—for the purpose of receiving the reply of the gas company as to the lighting of the public lamps. The town-clerk read the reply, which was as follows:—"Copy resolution passed at a meeting of the directors of the Huntingdon and Godmanchester Gas and Coke Company, Limited, held Jan. 12, 1875. The report of the committee of the Huntingdon Sanitary Authority, consenting to enter into a contract with this company to pay 6s. per 1000 cubic feet for the supply of gas to the public lamps of Huntingdon for one year, from the 1st of September, 1874, the lamps to be lighted as heretofore, was read. And it was resolved that the gas company do accept the price offered, and pledge themselves to rectify any proper complaint that may be made to the company of irregular or defective lighting with all practicable despatch; but cannot consent to any deduction being made from the sum to be paid under the contract, inasmuch as, from the high pressure at which the company are compelled to work, they find it impossible to make the burners (which are manufactured to consume 5 feet per hour), consume so small a quantity." On the motion of Alderman Herbert, seconded by Mr. Brown, the reply was accepted.

Legal Intelligence.

COURT OF CHANCERY.—THURSDAY, JAN. 28.

(*Before Vice-Chancellor* MALINS.)

Re THE TWYFORD (BERKS) GAS COMPANY (IN LIQUIDATION).

Mr. MONTAGUE COOKSON moved in this case under the following circumstances:—He said he appeared on behalf of the principal creditors, and the consent of the liquidator had been obtained for an order staying all proceedings. The order to wind up was made on May 3, 1872, and the official liquidator was appointed on the 27th of May. The debts at the date of the petition were only £404, and the assets of the company, exclusive of the works, only £116 0s. 7d. The share capital in £1 shares was £982. The matter was so small that the liquidator did not think it proper to proceed in chambers to settle the ordinary list of contributories.

The VICE-CHANCELLOR: You have served the official liquidator, and he appears and consents?

Mr. COOKSON: Yes; I suppose his costs will have to be provided for, and that must be entered in the order; but if any dispute arises as to the amount, that must be settled by the chief clerk.

STEVENSON *v.* MAYOR, ETC., OF TENBY (SOUTH WALES).

Mr. HIGGINS, Q.C., appeared in this case, and said the plaintiff was the lessee of the gas-works, under the corporation, and had filed a bill to restrain his being ejected from the premises. But the corporation had been advised that it would be necessary for them to serve their writ of ejectment, so as not to lose the next assizes. He wished to mention the matter on the part of the corporation, who were very desirous of not doing anything which should appear disrespectful to the court.

The VICE-CHANCELLOR: Mr. Glasse has a motion to restrain proceedings at law?

Mr. HIGGINS: Yes, sir; but he has not moved it.

Mr. GLASSE: I do not move, simply because there is evidence which I have not yet seen.

The VICE-CHANCELLOR: I am not aware, Mr. Higgins, that there is anything to restrain you.

ROLLS COURT.—THURSDAY, JAN. 28.

(*Before the* MASTER OF THE ROLLS.)

In re THE AIR GASLIGHT COMPANY, LIMITED.

Several applications were made under section 35 of the Companies Act, 1862, respecting the registration of transfers of shares in this company. In one case the court was asked to order the directors to register a transfer of 20 £5 shares (£4 paid) from a shareholder named Puckle to a member of the Stock Exchange named Boyle.

Mr. ROXBURGH, Q.C., and Mr. F. C. J. MILLAR appeared for Puckle; Mr. MAIDLOW for Boyle.

Mr. E. K. KARSLAKE, Q.C., and Mr. W. W. KARSLAKE, for the company, gave as a reason for declining to register the transfer that Puckle was indebted to the company for the costs of a dismissed winding-up petition, and that Boyle was, in the opinion of the directors, an irresponsible person, referring to the following passage in the articles of association:—"The company may decline to register any transfer of shares made by a member who is indebted to the company, or if the directors shall be of opinion that he is an irresponsible person."

The MASTER of the ROLLS asked how the court was to deal with the case if the articles of association made the opinion of the directors final. It was not alleged that the discretion of the board had been exercised maliciously or corruptly.

Mr. ROXBURGH replied that the objection to Boyle was unfounded, and was manifestly an afterthought, for the board had passed other transfers to him subsequently to the lodging of the particular one which they declined to register, and he suggested that the difficulty as to Puckle might be got over by taxing the costs just referred to, and thus ascertaining what was due from him.

A discussion ensued, in the course of which it became apparent that there had been a misconception of the directors as to Boyle's circumstances, and finally an order for registration was made, upon an undertaking by Puckle to bring into court £200, to answer the costs of the winding-up petition.

The MASTER of the ROLLS remarked that if there were any objection to Boyle as transferee, which he, for his part, saw no reason to believe, the company had precluded themselves from taking it. No order as to costs.

The same counsel appeared in Lord's case. The transfer was of 400 shares, and the proposed transferee was Joseph Levy, described as a gentleman. The motion was refused.

EDINBURGH COURT OF SESSION.—THURSDAY, JAN. 28.

FRASER *v.* LAIDLAW AND SON.

An action was raised in this court some time ago, at the instance of William Fraser, commission agent, St. Petersburg, now or lately residing at Midmill House, Dunfermline, against Messrs. Laidlaw and Son, engineers and contractors in Glasgow and Edinburgh, concluding for payment of the sum of £3500, being commission alleged to be due to him on the sum of £340,000, which the defendants obtained by the execution of certain water-works at Odessa. It was alleged by the pursuer that he was acting as agent in St. Peterburg for the defenders, and that through his agency they obtained the contract in question.

A supplementary action has now been brought, concluding for payment of the further sum of £5750 as commission, on the grounds that he has learned that the real sum obtained by the defenders in connexion with said contract was £570,000 instead of the sum mentioned, the actual state of matters having been concealed by the defenders in the former action.

The defenders aver that they obtained the contract from the limited liability company, by whom the money was raised for the carrying through of the transaction, after the pursuer had ceased to act as their agent in December, 1871; and they plead that they are entitled to *absolvitor* in respect that the contract in question was not obtained through the pursuer's agency.

The record in the supplementary action was closed on Thursday, before Lord Curriehill, and conjoined with the former action, and proof appointed to be led in the conjoined actions.

ASTON PETTY SESSIONS.—WEDNESDAY, JAN. 27.

(*Before Messrs.* COLLINS *and* LEDSAM.)

PROSECUTION OF STOKERS FOR UNLAWFULLY LEAVING WORK.

At the sessions held on the 22nd inst., thirteen gas stokers and labourers, employed by the Birmingham and Staffordshire Gas Company, at their works at Saltley, were summoned for wilfully neglecting their work. Two only of the defendants appeared, and the summonses against them were withdrawn. Warrants were granted for the apprehension of the eleven other defendants. Two of the latter were now brought up on a warrant—*Thomas Jordan* and *Walter Howard*—the other men not having been apprehended.

Mr. JESSON (solicitor) made an application on behalf of the company for the prisoners to be remanded for a week, to allow of the arrest of the others.

The CLERK (Mr. Perkins) replied that Mr. J. Ledsam, having an interest in the gas company, could not adjudicate, and as two magistrates were required to sit in order to grant a remand, the prisoners would have to be discharged.

The prisoners were accordingly liberated.

HEREFORD POLICE COURT.—MONDAY, JAN. 18.

(*Before Dr.* BULL, *Chairman; Mr.* BOSLEY, *and Capt.* UNDERWOOD.)

CONVICTIONS FOR WASTING WATER.

The TOWN-CLERK attended to prosecute several summonses for alleged waste of corporation water. He said for some time past it had been brought to the knowledge of the corporation that the supply of water in the upper portion of the city had been of an inefficient character. Complaints were frequently coming before the corporation, and they determined to ascertain the reason of the deficiency. At different times it had been brought to the knowledge of the corporation that a much larger quantity of water was used in this city than the portion which was generally allowed per head throughout the country. He thought he might say that the allowance per head of water in a large number of towns was about 30 gallons per day, but in this city it was double that quantity. There must be some reason for that, and he thought it might fairly be attributed to the undue waste at the taps in the lower portion of the town. These facts being so, during the late inclement season the insufficiency of the supply was very much aggravated.

The CHAIRMAN remarked that the dates of most of the summonses were three days after the frost.

Mr. CARLESS said the pipes did not get over the results of frost for a fortnight or so. Now, ever since the corporation had these matters under their attention, they had issued in very large numbers a bill calling the attention of all consumers to the fact, that whoever committed a waste of water was breaking the conditions of the Act of Parliament. That bill had been very largely circulated, the subject had been much discussed, and there could be no question about this, that if it had not got to the knowledge of all the consumers it ought to have done so, and they should all be perfectly well acquainted with the fact that, by leaving taps open and the water thereby running to waste, they were breaking the law. The corporation had before been obliged to bring forward cases similar to those before the bench to-day, and in some cases, rightly or wrongly—most probably rightly—the persons summoned had been let off with a small penalty, upon making certain explanations that they did not know they were doing wrong, and so on. He did not question that decision, but at the same time the position of the corporation was this—they must, if they possibly could, stamp out the undue waste of water, for it was that waste which was creating an insufficient supply to the city at large; and everybody must now know that it was not right to waste the water. Therefore, if he succeeded in proving the cases now before the bench, he hoped they would bring before the public a few examples and stop this waste, in order that the corporation might have it before them whether or not they were adopting the right course in taking these steps.

Mr. *W. J. Phillips* was charged with leaving carelessly open a certain valve or pipe, whereby the water of the Town Council was wasted.

George Pritchard, a labourer, said he had been employed by the city surveyor to inspect the water-taps of the city; on the 8th of January last he went, in pursuance of that duty, to the house of Mr. Phillips, where he found the tap left open in the closet, and the water running to waste.

Mr. ARTHY appeared for the defence, and in the course of his cross-examination of the witness he found out that a book was used specially for the purpose of entering the names of the persons against whom there was any complaint. That book, Mr. Arthy said, ought to have been produced, and eventually the case was adjourned for a short time, in order that the witness might go and fetch it.

When, however, at a later period of the sitting, it was produced, it merely confirmed the complainant's case.

Mr. ARTHY then briefly addressed the bench on behalf of his client. He said that Mr. Phillips did not dispute that the water might have been running at the time the witness visited his premises, but he had given strict instructions to his domestics and others that no water should be allowed to run to waste. He had the "caution" bill of the corporation fixed up opposite the tap, and had taken every precaution in his power to prevent the water from running to waste. It was also most unfair that the Water-Works Committee should have chosen for their inspection just the season of the year when it was almost necessary that the taps should be left running. What were they to do to keep the taps from freezing, unless they allowed them to run all night?

The BENCH pointed out that for that purpose merely a few drops were necessary.

Mr. ARTHY still maintained that this was a very unfair time of the year. With regard to his client, he said Mr. Phillips was not at all aware that any water had been running to waste that day until he received the summons.

A number of other summonses for similar offences were heard, the defences in most of them being that the pipes were out of order through the recent severe frost. In one instance, however, a brickbat had been put under the handle of the closet, and in another a piece of board, to keep the valve open.

After a short private consultation,

The CHAIRMAN said the magistrates had considered the cases, and had decided to convict in every instance. There was, however, something to be said on behalf of these people, inasmuch as the inspection was made at the close of the very severe weather. Everybody must know, however, that by allowing their taps to continue running they were taking from the supply in the other parts of the city. At the same time the magistrates thought it would have been very much more satisfactory if two inspectors had been employed instead of one, so that the bench might have had corroborative evidence. In most of the cases now before them neglect had either been proved or admitted; and although some of the defendants might have been quite certain that their taps were running for about five minutes, unfortunately for them there was no proof of that. Messrs. *Phillips*, *Watkins*, *Seed*, *Brasher*, and *Bottrell* would be each fined 5s. and costs; in the case of Mr. *Rudge*, the fine would be 10s. and costs; and the other defendants would be fined 6d. each, and the costs apportioned between them. He need scarcely say that the alternative of the 5s. fine would be seven days hard labour; of the 10s. it would be 14 days.

BARTON GAS SUPPLY.—OPPOSITION OF THE SALFORD CORPORATION TO THE BILL OF THE LOCAL BOARD.—A public meeting of ratepayers and property owners, convened under the Municipal Corporations (Borough Funds) Act, was held in the Salford Town Hall on the 25th ult., to approve or otherwise of the opposition offered by the Salford Corporation to the bill which Parliament will be asked to sanction next session, authorizing the Barton Local Board to erect gas-works, instead of purchasing their gas from Salford. The mayor said that the corporation were in duty bound to protect the vested interests of the borough. An Act was obtained by the Salford Commissioners in 1830 to supply gas to the outlying districts of the borough; and an application was made by the large consumers in the district of Eccles and Patricroft, in 1853, to the Corporation of Salford, to supply them with gas. In consequence of that application, gas was supplied in the following year to consumers in Eccles and Patricroft, and this caused the extension of the gas-works in Regent Road in the year 1851. The corporation had increased their supply of gas, and commenced to supply gas to Little Hulton, through Barton, in 1862, and since that time large sums of money had been spent in order to keep the out-districts properly supplied with gas. Consequently, it was quite necessary that the corporation should protect their interests and oppose the bill of the Barton Board. He concluded by moving—"That the meeting consent to the opposition by the council of the borough to the Barton Gas Bill promoted by the Barton Local Board." Alderman Tysoe seconded the motion, which was passed unanimously.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

WHITECHAPEL DISTRICT BOARD.

A Meeting of the Board was held on the 24th ult.—Mr. T. BRUSHFIELD in the chair—the most important business of the day being the consideration of the gas bills promoted by the Metropolitan Board.

Mr. MUNRO moved that this board do oppose the bills. He reminded the members, that at the meeting on the 11th of January the Works Committee brought up a report recommending that petitions should be presented to Parliament against these measures, and that after some discussion the further consideration of the report was adjourned. Since then the members had been furnished with copies of two of the bills, from one of which it would be seen that the Metropolitan Board proposed to purchase the undertakings of 16 gas companies, the necessary funds for which would be raised on the security of the rates. To such a proposition he was most determinately opposed, believing that it would press unfairly upon the ratepayers of the metropolis, because all were not consumers of gas as they were of water. He questioned very much if half the ratepayers consumed gas, and therefore the Metropolitan Board ought not to be allowed to raise capital on the security of the whole, to benefit only a section of the ratepayers. Besides, for the 46 persons composing the Metropolitan Board to suppose that they could manage the works of 16 companies, in addition to their other business, was out of the question. Those companies required the constant attention of about 144 gentlemen, who were acquainted with all the details, and were, moreover, paid by fees for looking after the interests of their shareholders. With regard to the second bill, to construct works, he looked upon that as a bogus bill. It could never be the serious intention of the Metropolitan Board to construct works to compete with the gas companies—such a scheme would certainly not be sanctioned. They would have to acquire 760 acres of land, to form railways, and acquire running powers. He admitted the necessity that some regulations should be enforced on the gas companies to secure something like uniformity in price, but he urged the board to oppose the two bills now before them.

Mr. GLADDING seconded the motion, and said he viewed the two bills as curiosities, and should like to know which of them stood first.

The CHAIRMAN said he thought the New Works Bill would come first, but some of the members expressed a contrary opinion.

Mr. GLADDING said he objected to the two bills, because they did not come before them in a proper form. They had been told over and over again that the corporation and the Metropolitan Board had jointly considered themselves responsible, and were about to take action for the provision of gas for the whole metropolis, but by the bills it seemed that the corporation was only to be a customer to the Metropolitan Board of Works; the latter body being the purchaser, the negotiator, the speculator, and the owner. After the works were obtained, the City of London could claim to be put in possession of so much as concerned the City of London, and no more. The members of this board were now coming to understand what he had urged for many years—viz., that it was impossible the 46 members of the Metropolitan Board could properly manage what they had already in hand, and that, therefore, to give them control of such speculations as they now proposed to enter upon would be not only absurd, but dangerous to the welfare of the community. If on no other ground, this was sufficient reason for opposing these bills. But then there was the question of the market value of the property to be purchased, which was greatly in excess of the actual value of the works. He had seen a statement, made upon good authority, that if the companies interests were purchased at the market price it would cost the ratepayers 1s. 6d. per 1000 feet more for gas than if new works were erected. That being so, the metropolis would be weighted with contingencies. Then, again, who could tell how long gas would continue to be the illuminating power? From time to time inventions were brought before the public which seemed to indicate that other means of obtaining light may some day compete with, and, perhaps, supersede gas. If it were possible to purchase the interests of the companies at their original cost, it might be a fair speculation; but weighted with the contingencies to which he had alluded, it could not be beneficial. He had already insisted that 46 men could not manage what it now required nearly 200, who were deeply interested in and understood the business, and were paid for looking after, to do. But the strange absurdity of the Metropolitan Board was more apparent, because they proposed, when they had acquired these enormous works, to hand over the management of such a great matter to a committee. It was positively monstrous. Speaking in the interests of the public, and from experience of human nature, he declared that without careful superintendence in every large establishment, dishonourable persons would be found to take advantage of the circumstances. This was only human nature. He had no intention of saying a single word against any individual or parties connected with the board at present, but he would say plainly that, in his opinion, such a system as that proposed would lead to serious corruption. Without care in the management of all large concerns, waste and corruption would step in, and it was simply impossible for the Metropolitan Board to faithfully discharge the duties in connexion with so great an undertaking. If they intended to do so they would require to be greatly increased in number. This was an age of new notions, but their forefathers had a deal of common sense, and always maintained that the municipalities should be constituted of a large number of citizens, and this principle was still adhered to by the Corporation of London, whose Markets Committee consisted of 70 members. If it required 70 persons to manage the City markets, it would be easy to demonstrate that the Metropolitan Board could not undertake the management of the gas supply with their small number of members. If they did, good-bye to gas at anything like 3s. 6d. and 3s. 9d. per 1000 feet. With regard to the second bill, proposing the erection of new works, no calculation seemed to have been made of the fact that there were gas companies already in the field, and this project was, therefore, equally absurd as the first.

Mr. SHELTON thought the matter should be left in the hands of the Metropolitan Board, whose numbers could be easily augmented by the Legislature if it was found there were not sufficient for the work devolving on them. The Metropolitan Board had done their best to remedy what was admitted to be a crying evil. It was true that in the East of London the consumers were well treated by the Commercial Gas Company, but the other parts of the metropolis had not been so fortunate, and the eastern district should regard the matter from a metropolitan point of view. He maintained that the Metropolitan Board had the interests of the ratepayers at heart, and had done what they thought best to secure better treatment for the consumers of gas.

After some further consideration, the motion was put and carried, with three dissentients, and the matter was referred back to committee for the purpose of preparing a petition.

METROPOLITAN BOARD OF WORKS.—At the meeting of the board on Friday last, a communication was received from the Wandsworth District Board of Works, protesting against the proposal of the Metropolitan Board of Works to purchase, for the purpose of a gasholder station, the Latchmere allotments, Battersea, such allotments having been for many years past let to poor parishioners for cultivation, and also objecting to the introduction of any additional gas-works into the parish. The communication was referred to the Parliamentary Committee. This proposition of the board has created great dissatisfaction among the inhabitants of the district, who consider that the site has been improperly selected, and that the absorption of the land for the erection of the proposed buildings would be a great hardship to the labourers and artisans who have occupied it for so many years. The Battersea Vestry, amongst others,

are taking steps to oppose this part of the bill; and at a meeting of that body, held recently, a resolution was passed to the effect that the Metropolitan Board be asked to reconsider their decision, and to amend their bill, that the privileges which the labourers had for so many years enjoyed might be preserved to them. It has been also decided to bring the matter under the notice of the members for that division of the county—the Attorney-General and Sir Henry Peek—with the view of securing their support in opposition to the project. At the meeting of the board on Friday, the Works Committee recommended that Mr. J. Herbert be informed, in reply to his letter stating that he possessed a plan for manufacturing gas which would effect a saving of from 20 to 30 per cent., and increase the illuminating power, and requesting that an opportunity might be afforded him of explaining his method, that the board were unable to accede to his suggestion. A letter was received from the Imperial Gas Company, stating that the price of their gas for the current year will be at the rate of 3s. 9d. per 1000 cubic feet, and that the charge for the supply of gas to the board's lamps will be at the rate of £5 per lamp instead of £5 15s. A letter was also received from the Lewisham District Board, stating that the licence to the New Gas Company to store petroleum will expire in April next, and requesting to be informed of any application for its renewal, and also of all future applications for licences in the district.

COURT OF COMMON COUNCIL.—At the meeting of the City Corporation, on Thursday last, Deputy Fry had the following notice of motion on the *agenda:*—"That this court, being desirous of expressing its opinion upon the Metropolis Gas Undertakings Purchase Bill, prior to the Gas and Water Committee taking any further action in prosecuting the same in Parliament, instructs the committee to report thereon forthwith, furnishing such information and particulars as may be deemed necessary to assist in forming a judgment upon its several provisions." He said, in his opinion, this motion should be at once considered by the court. The corporation had been pledged to measures which they had never had an opportunity of considering, and it was most important that the opinion of the court on the subject should be expressed. Mr. Bontems moved, and Mr. Symons seconded, a resolution to the effect that the motion referred to should be then considered, which, on being put, was negatived. It was ultimately agreed that this motion should be taken as the first business at the next sitting of the court.

LEWISHAM DISTRICT BOARD.—At the meeting of this board on Wednesday last, Mr. Heisch, gas examiner, reported that the illuminating power of the Phœnix Company's gas on Jan. 15 was 15·6 candles, and the quantity of sulphur per 100 feet 23 grains. The illuminating power of the Crystal Palace District Company's gas on Jan. 19 was 17·4 candles, and the sulphur per 100 feet 37 grains. The board ordered a letter to be written to the Phœnix Gas Company, pointing out that the quantity of sulphur was still largely in excess of the quantity allowed by law. The Crystal Palace District Gas Company attributed the excess of sulphur to damage to a valve, which allowed the passage of the foul gas into the main. They promised to repair it as soon as practicable, and the board allowed a few days respite for the purpose. The average returns kept at the works for the last six months were 13 grains per 100 feet. Several district boards and vestries of the metropolis sent their thanks to the Lewisham Board of Works for the proceedings taken to ensure a pure supply of gas. The Lambeth Vestry requested to be furnished with 150 copies of the pamphlet recently issued on the subject by the Lewisham Board of Works. The board acceded to the request, the Lambeth Vestry to pay the cost of the copies.

PANCRAS.—At the meeting of the vestry of this parish on Wednesday last, a report of the Rating Committee was adopted, recommending a revaluation of the Imperial Gas Company's works and mains, the New River Company and their mains, &c., &c.

METROPOLITAN BOARD OF WORKS AND THE WATER COMPANIES.

FIRES IN THE METROPOLIS.

The following circular letter was addressed to the several metropolis water companies towards the close of last year:—

"*Metropolitan Board of Works, Spring Gardens, S.W., Dec.* 24, 1874.

"Sir,—The attention of the Fire Brigade Committee of the board has lately been called, by complaints and inquiries from local boards and others, to the delays which, even with the best efforts on the part of the water companies, occasionally occur in obtaining a supply of water at fires.

"The committee is well aware that the only certain way of avoiding these delays, and of being always sure of an immediate supply of water available for extinguishing fires, is to have all the mains constantly charged at high pressure. But the committee is anxious to ascertain whether, in the interval of time which will probably elapse before the attainment of this desired state of things throughout the metropolis, some means might not be found by which the men of the fire brigade would be able, on arriving at a fire, to obtain immediately for themselves a supply of water without waiting for a turncock, in the event of the latter not being at a fire so soon as themselves.

"With each fire-engine is always carried, as you are aware, a complete set of turncock's tools, so that the firemen have the necessary implements; and what is wanted under the present intermittent system of supply, to enable them to get water for themselves, is a knowledge of what mains in the immediate neighbourhood are charged with water at the time. The Fire Brigade Committee, therefore, ventures to suggest, and would ask your directors kindly to consider, whether some plan could not be adopted of turning the water into the various mains at certain fixed hours of the day, and of making the fire brigade acquainted with the hours fixed for each part of the district, so that, on reaching a fire, the brigade might know at once where to go for water.

"Will you be good enough to lay this letter before your directors, and make the Fire Brigade Committee acquainted with their views upon the suggestion offered in it?—I am, sir, your obedient servant,

(Signed) "J. E. WAKEFIELD, Clerk of the Board.

"The Secretary, —— Water-Works Company."

To this circular letter the following reply was sent by the New River Company:—

"*New River Office, E.C., Jan.* 6, 1875.

"Sir,—Your letter of the 23rd ult. on the subject of water supply at fires has been laid before the directors of the New River Company, and in answer thereto I am instructed to assure you that it has always been the anxious desire of this company to make every arrangement connected with water supply for extinction of fire in their district as perfect as possible, and, so far as their province in this matter extends (and even beyond it), they have taken measures to render delivery of water from their mains at fires as prompt and efficient as it can, under existing circumstances, be made.

"Allowing that arrangements for supply of water for extinction of fire cannot be deemed perfect without a 'constant' high-pressure supply in *all* pipes, they would have it remembered that it is only the present condition of water fittings in houses which renders constant supply to the whole of their district impracticable. *All* the company's 'mains' (having an aggregate length of 218 miles) are already always charged at high pressure; but the power of fire extinction thus at command in these, or in any other pipes, can only be made available by the *substitution of hydrants for plugs.*

"With regard to the suggestion of your committee that the times of turning water into 'mains' should be fixed, and that *the men of the fire brigade should be made acquainted therewith*, the directors of the New River Company have to state that it is only the 'services' branching from their 'mains' which are subject to periodical shuttings and openings, and that these take place at *fixed* times daily; but to instruct firemen in the times of all such 'service' shuttings and openings would amount to their instruction in nearly the whole of the duties of all the company's turncocks, which would hardly be practicable. Moreover, it does not appear that there would be any advantage in the mere knowledge by firemen of the times at which different 'services' are daily under pressure, as they can always ascertain, by the simple drawing of a plug, whether any particular pipe from which they want supply has pressure in it or not.

"It seems to the directors of the New River Company that what is required to enable firemen to draw water for *themselves* (and this is the one great desideratum of the matter) would be secured in every part of the company's district (with no more constant supply than exists now) by placing hydrants at proper intervals on the 218 miles length of already constantly charged 'mains,' and by adopting an improved system of marking the positions of 'service' plugs and cocks.—I am, sir, your most obedient servant,

(Signed) "ALEX. INGLIS, Clerk.

"J. E. Wakefield, Esq., Clerk,
"Metropolitan Board of Works, Spring Gardens, S.W."

The West Middlesex Company sent the following reply:—

"*Office of West Middlesex Water-Works,* 19, *Marylebone Road, N.W., Jan.* 13, 1875.

"Sir,—Your letter of the 23rd ultimo, with reference to the supply of water at fires, having been laid before the directors, I am instructed to inform you that the company are most desirous of co-operating with the Metropolitan Fire Brigade, so that as far as possible no delay shall take place in supplying water for the purpose of extinguishing fires.

"The company have already made several suggestions to the Metropolitan Board of Works and to Captain Shaw in order to effect this object, and they regret that none of them have been adopted; for instance—

"1. They have proposed to instruct the men of the fire brigade in the use of the tools furnished to them, and in a knowledge of the position of the main and service cocks necessary to be opened whenever a fire occurs; this was declined by the late Mr. Braidwood, and not accepted by Captain Shaw when I wrote to him on the subject on the 22nd of May, 1867.

"2. The company have provided fixed residences for their men, so that there should be no alteration of station in the event of a change of turncock; and the directors offered to have the address of the nearest turncocks stations painted on the doors of the fire-engine stations, of which no notice has been taken.

"3. The company have repeatedly suggested that apartments should be provided at the fire brigade stations for a turncock, for which apartments the company offered to pay rent; this was not acceded to by the Metropolitan Board. (See their letter of date the 12th of February, 1868.)

"4. The company have also suggested that two lads should be kept at each fire-engine station, whose special duty it should be (one by night and one by day) to call the turncocks as soon as intelligence of a fire reaches the station.

"The company's engineer, superintendents, and inspectors, will be happy to place themselves in communication with the officers of the fire brigade, and afford them every information and facility for obtaining water at all times; and I hope it will be felt that the company's existing arrangements have been hitherto very satisfactory, as I find from the record of the fires kept in this office, that, where engines attended, 62 fires (exclusive of chimneys) have happened in this company's district, within the metropolitan area, during the year 1874; out of which the turncocks arrived before the fire-engines 40 times; at the same time as the engines, 19 times; and after the engines, 3 times; but in these three last cases the engines were not worked.

"The company pay rewards both to the first and second persons who call the turncocks, and have also lately increased the pay of their turncocks for attending to this special duty.

"The directors feel there would be great difficulty in complying with the suggestion of the Metropolitan Board in turning on the water at certain fixed hours of the day otherwise than is done at present, and it would not be of much use to furnish a list of the streets, &c., with the time the water is now turned on, as alterations are necessitated in summer and winter, and occasionally from other circumstances. The firemen can always ascertain whether the water is or is not on in a street by starting a plug, and I am desired to add that in this company's district there are about 67 miles of streets and roads wherein the mains are constantly charged.

"I am also directed to call your attention to a letter which I wrote to the late Sir William Tite, an influential member of the Metropolitan Board of Works, on the 10th of May, 1867, at the time a committee of the House of Commons were considering a 'Fire Protection' Bill, which letter, if you have it not, and the board would like to have a copy, the directors will be glad to furnish it.—I am, sir, your most obedient servant,

(Signed) "W. H. WHIFFIN, Secretary.

"J. E. Wakefield, Esq., Clerk, &c., Metropolitan Board of Works,
Spring Gardens, S.W."

The reply of the East London Company was as follows:—

"*East London Water-Works Company,* 16, *St. Helen's Place,*
"*London, Jan.* 14, 1875.

"Sir,—Your letter of the 24th ult., on behalf of the Fire Brigade Committee of the Metropolitan Board of Works, on the subject of the 'complaints and inquiries from local boards and others,' with reference to 'the delays which occasionally occur in obtaining a supply of water at fires,' has been under the consideration of the directors of the East London Water-Works Company.

"The directors are informed by this letter that the committee is 'well aware that the only certain way of avoiding these delays, and of being always sure of an immediate supply of water available for extinguishing fires, is to have all the mains constantly charged at high pressure,' and that the committee is 'anxious to ascertain whether, in the interval of time, which will probably elapse before the attainment of this desired state of things,' the fire brigade might not be enabled, 'on arriving at a fire, to obtain immediately for themselves a supply of water, without waiting for the arrival of the company's turncock.'

"Your letter further suggests that as with each fire-engine a complete set of turncock's tools is carried, nothing more is 'wanted during the present intermittent system of supply, than a knowledge of what mains in the immediate neighbourhood are charged with water at the time,' and you ask 'whether some plan could not be adopted of turning the water into the various mains at certain fixed hours of the day, and of making the fire brigade acquainted with the hours fixed for each part of the district,' whereby the brigade might, on reaching a fire, know at once where to go for water.

"Your letter concludes by asking that the fire brigade may be made acquainted with the directors views on the suggestions offered.

"The directors have received these suggestions and inquiries with profound astonishment.

"They would in any case be unable to point out how the plan you submit for adoption could be carried out; but, under existing circumstances, it does not seem necessary to pursue that view of the subject.

"You are requested to refer to my letter to you of Dec. 17, 1872, on the subject of supply of water at fires, and especially to the following paragraphs of it:—

"'Now of these mains there are within the company's limits at least 150 miles laid in at least 100 miles of public streets and roads (sometimes one main and sometimes more in the same street or road), and in which the water is,

and for many years past has been, in constant supply under pressure.* To this full extent, therefore, there may now be, and there might for several years past have been, placed any proper hydrants and other apparatus which the public authority in charge of this duty might desire and might adjust with this company. . . . I am to add that for several years past there have been within the company's limits very many miles of "service"-pipes in which the water has been in constant supply under pressure. This mileage has been continuously increasing, and now amounts to more than 50 miles of service-pipes.† . . .

"'I am to add that, making this communication in the sincere desire of promoting improvement, and not merely of removing "from this company a cause of expense to themselves and of dissatisfaction to others, the directors and their officers will be found most ready to give every further explanation and information which may assist the Board of Works in the exercise and performance of the duties imposed on them in connexion with this important subject.'"

"The receipt of this letter was acknowledged; but, except so far as your letter of the 24th ult. may be so considered, no communication of any kind has been made to this company by the Board of Works on the subject of it; nor, so far as the directors are informed, has any step been taken by them for availing themselves of the condition of things which was thus brought under their notice

"On the 31st of December, 1873, this company reported to the Metropolitan Board of Works, in a letter addressed by me to you, the complete introduction, under the powers of the Metropolis Water Act, 1871, of constant supply into a part of their district, comprising 6406 houses.

"This letter concluded with the following paragraphs:—

"'I have only further to notice that throughout the area which was the subject of the notice of November, 1872, and in which the transfer of the houses (the 6406 houses above referred to) has been just completed, there is now the full opportunity for the Metropolitan Board of Works to place fire hydrants not only upon mains, but upon services. It will be recollected that you were, by my letter of the 17th of December, 1872 (to which the directors have not as yet been favoured with any reply), informed that there were then in the district, alone of this company, 150 miles of mains in at least 100 miles of public street, and, in addition, 50 miles of service-pipes of 5 inches diameter, all which mains and services were under constant supply, and on any of which fire hydrants might at any time during several years then passed have been placed. This mileage of services is now largely increased by the addition of those in the streets, &c., of the district, brought into constant supply under the notice of November, 1872.

"'I am instructed on the present occasion, as when I addressed you in December, 1872, to tender your board any further explanation which, in exercise of their powers and performance of their duties in connexion with these important subjects, they may require.'

"This company has received no communication of any kind from the Board of Works respecting this second letter, beyond the acknowledgment of its receipt.

"In December, 1873, the notice, rendered necessary by the Act of 1871 was served by this company on the board, intimating the company's intention to bring a further part of their district under constant supply; and on the 15th of October, 1874, a third (similar) notice was so served, and later in the same month a fourth such notice. The company have completed the conversion under the second notice, and are actively engaged in the conversion to which the third notice refers. The statutory notices are running in the fourth case, and the company will proceed with the intended changes so soon as they are expired. These several areas, as the notices show, adjoin. Together they comprise about 14,000 houses, and about 20 miles of mains, and 45 miles of services.

"But, except the formal acknowledgment of the notices, not a word of communication or inquiry has come to this company from the Board of Works on the subject of them; nor, so far as the directors are aware, has there been on the part of that board, in this company's district, one iota of change in respect of their user of the company's water in the case of fires.

"Notwithstanding all the information and action on the one hand, and silence and inaction on the other, the directors are now told that the Fire Brigade Committee 'is well aware that the only certain way of avoiding the delays complained of, and of being always sure of an immediate supply of water available for extinguishing fires, is to have all the mains constantly charged at high pressure,' and that 'what is wanted under the present intermittent system of supply' is 'a knowledge of what mains in the immediate neighbourhood are charged with water at the time' of a fire. This is somewhat disheartening, and leads the directors to fear that mains may continue to be constantly supplied, and notice thereof given in vain.

"Indeed, the directors are constrained to conclude that, notwithstanding the great anxiety of the Metropolitan Board of Works for the introduction of the constant supply, and for better arrangements for the use of water in the extinction of fires, my letters of December, 1872, and December, 1873, have never been read or never been considered; and that the bearing on this subject of this company's action in the districts which they have brought, and are bringing, entirely (mains and services) into constant supply under pressure, has never received the attention of your board.

"Under their instructions, and in the hope that it may be no longer misunderstood or unappreciated, I briefly recapitulate the position:—

"'1. There is, throughout this company's district *within the metropolis*, a constant supply of water under pressure (day and night, Sundays and holidays) in all their leading water carriers or mains; these mains occupying at least 70 miles of streets and public ways.

"2. On these mains there are neither fire-plugs nor hydrants—no plugs, because they would be driven out by the pressure; no hydrants, the Metropolitan Board of Works knows why.

"3. There is in the same district a constant supply under pressure in 'services' throughout the two areas described in the notices of December, 1872, and December, 1873, and in a few weeks this will be true of the third and fourth areas described in the notices of October, 1874; and besides *these* 'services' there are 100 miles of services constantly so charged in various other parts of the company's district.

"4. The directors are quite prepared—and would have been found at any time prepared—to allow the company's officials to attend upon any officers of the fire brigade, and point out to them *in situ* the mains and services to which allusion has been made, and everything else which they may desire to know or ought to know, and the company would be still willing to continue the gratuitous services of their turncocks as heretofore. Even on the full introduction of the constant-supply system, the companies must still have turncocks, and they would, perhaps, always be better acquainted with the surfaces of the streets—their marks and changes—than the fire brigade men.

"5. The position of all plugs available for fire service, and of the cocks commanding services, can, if desired, be marked on an illustrative map. Thus the men of the brigade would, with 'the necessary implements,' be enabled to gain immediate access (turncock or no turncock) to the company's water.

"6. The company would willingly extend this information and map to the *services* in that part of their district within the metropolis where the services are intermittently supplied; but as these will be continually reduced in number, and the *mains* in these parts are constantly supplied, it would seem unnecessary so to extend the map.

"I am to add that, whilst anxious to afford your board all the aid which can reasonably promise improvement in the present state of the question, the directors feel strongly the injustice of the position in which the company is placed. The company are purveyors of water only. They admit that it is their duty to allow their water to be taken gratuitously for the extinction of fires, and to facilitate its use in every way consistent with the prior and yet more important duties of the company; but they protest that it is not their duty to bear the expense incident to maintaining the present slovenly and imperfect practice, and that they ought not to be subjected to the aggravated waste which is necessarily incident to it.

"On the contrary, they call upon the Metropolitan Board of Works to appreciate and avail themselves of the condition of things which has been so carefully and repeatedly brought under their notice, to place proper hydrants upon the mains and available services, to assume the entire responsibility of their maintenance and use, and to relieve the public from the dangers and losses to which they are exposed, and this company, not merely from the expense, but from the obloquy to which they are so unjustly subjected.

"It is not the state of the water supply, but the means of using it, which are at fault; and it is just and necessary that now, at least, this undoubted truth should be no longer misunderstood; and that it should be made generally known to whose neglect it should be attributed that the public are, to so great an extent, in this company's district, deprived of proper safeguards against fire.

"The directors are not aware whether you are making inquiries of the other metropolitan water-works companies, similar to those addressed to this company in your letter of the 24th ultimo. This letter emanates from the East London Water Company alone, and is written without reference to the other companies or the conditions of the water supply in other parts of the metropolis; but the directors desire me to call your attention to the "general remarks" appended monthly to the official reports of Major Bolton, the water examiner appointed under the Act of 1871, respecting the water supplied by the metropolitan water companies. In these public documents will be found monthly a statement of "the number of miles of streets which contain mains constantly charged, and upon which hydrants could at once be fixed in each district of the metropolis." The total length of such mains stated in Major Bolton's report of the 1st of October, 1874, is 666½ miles. Owners availing themselves of this position appear in many instances to have established hydrants within their private properties. Your committee—better than Major Bolton, or the directors of this company—can tell how many have, in fact, been fixed upon these mains and are available for *public* use; and it is well that the public should know with whom rests the responsibility of withholding the proper means for the extinction of fires, the opportunity for supplying which has thus been so repreatedly brought under notice.—I am, sir, your obedient servant. (Signed) "E. Bates, Secretary.

"J. E. Wakefield, Esq., Clerk, Metropolitan Board of Works."

The Southwark and Vauxhall Company have at present simply acknowledged the letter of the board, and have instructed their engineer to make personal explanations.

* The company's limits extend beyond the metropolis; and the number of miles of main in constant supply under pressure in the latter area is (Dec. 31, 1874) about 120—that is to say, 70 where there is (in the houses) constant supply, and 50 where there is (in the houses) intermittent supply.

† There are in all (Dec. 31, 1874), in the company's district within the metropolis, five times this length of service-pipes—that is to say, of pipes leading off from the mains and feeding the "communication-pipes," which latter form the connexion with the houses individually; and, of these service-pipes, at least half are in constant supply under pressure.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held on Friday last, Jan. 29—the Rev. Dr. Phelps, Master of Sidney Sussex College, in the chair.

The directors, in their report, recommended a dividend for the half year after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the amount paid up on the new shares, payable on the 1st of February next, free of income-tax. The company's manager, Mr. Wood, had resigned his office in the company's service, and the directors, taking into consideration the constant watchfulness required on the part of the manager in the manufacture of the gas, the attention that he must give to all the apparatus to keep everything in complete repair and working order, the time required in studying and carrying into effect improvements in the mainage and its extensions, and the daily demands of the public for alterations and corrections in the arrangement of fittings, the investigation of escapes, and the detection of faulty service-pipes, had come to the conclusion that the finance department of the company's business should be entirely separated from that of the manager. In accordance with this view, they were glad to be able to state that they had been so fortunate as to secure again the services of Mr. F. G. Gifford, who was already so well and so favourably known to the company, and who had accepted the office of cashier and general superintendent of the accounts; and they had appointed as manager Mr. Weeks, a gentleman recommended to them in the very highest terms by Mr. Hawksley, the company's engineer. The directors feel sure that this arrangement will be advantageous to the company, and meet with the approbation of the shareholders.

Appended to the report, as circulated amongst the shareholders, was a statement of accounts for the half year ending Christmas last.

The Chairman proposed that the report of the directors, which was taken as read, be received and adopted, and congratulated the shareholders on their dividend, and on the general financial condition of the company. He appealed to them for their generous confidence in the directors, who had had a most anxious half year to go through, and he felt certain such confidence would not be misplaced. Nothing had been omitted on the directors part to do everything that was right, both as regards the company and the public. They had just entered upon a new management, and in some measure a new system; and the directors, with their new accountant, Mr. Gifford, and other officials, had gone through everything relating to the affairs of the company with the greatest possible care and attention.

Dr. Fawcett seconded the motion, which, after some discussion as to the system of balancing the cash-book daily, was agreed to.

Dividends after the rate of 10 per cent. per annum on the consolidated stocks, and 7 per cent. on the amount paid up on the new shares, were declared.

The Mayor gave notice that at the next meeting he would move that Mr. Gifford should be paid the sum promised to him when the directors made the agreement with him.

A vote of thanks having been awarded to the chairman, on the motion of Mr. T. Allen, seconded by the Mayor, the proceedings terminated.

CAMBRIDGE WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held on Friday last, Jan. 29—the Rev. Dr. Okes in the chair.

The directors, in their report to the shareholders, proposed a dividend on the consolidated stock, and on the first call upon the new £2 shares for the half year ending Jan. 6, 1875, at the rate of 10 per cent. per annum, to be paid on the 1st of March next, free of income-tax. The report adds: "The accounts show that the income from two sources, the water account (sundries) and the fittings account, has been exceptionally large, and will probably not escape the notice of shareholders generally as material for revenue very liable to fluctuation.

That part of income, however, to which the company naturally looks for its main support, the water-rates, has steadily increased, and is constantly receiving fresh accession of strength as the value of the water supply becomes more generally acknowledged. As the population and habitations of the town increase, the demand for supply co-extensively increases with them. Mr. Dennis retires from the auditorship, and has expressed a wish that he may not be again put in nomination for the office. The retiring directors are Mr. Elliot Smith and Mr. Wentworth, who are eligible for re-election."

The report of the engineer and manager (Mr. Tomlison) stated that during the past half year, water from the company's works had been laid on to 138 premises, the increased rental derivable from which was £159 per annum. The total number of premises now supplied was 6250. The general condition of the company's works was satisfactory.

The CHAIRMAN, in proposing the adoption of the directors report, congratulated the shareholders upon the satisfactory condition of the company. At the end of seven years they had arrived at a goal to which they had long been looking forward. In regarding the state of the company, a little caution was necessary in arriving at a correct judgment, as the accounts, under certain conditions, were subject to fluctuation. He believed that the half year ending in January was always the most favourable one. In reference to the "Engine account," there had been a considerable reduction in the sum expended in comparison with the corresponding half year of 1874, when the account was £232 4s. 7d. This was in a great degree due to the good management and engineering skill of one in whom they had great confidence. The "Fuel account" showed an expenditure of £285 3s., as against £381 11s. 9d. for the corresponding half year of 1874. The large item for the repairs to the paper-mills brook was owing to no fault of the directors. The mischief had been caused by some coprolite diggers, who brought their work too near the mills, and caused the water to percolate through the bank. An injunction was laid against their proceedings, and the company were put to considerable expense, and could not recover their money on account of those who were supposed to have been men of substance turning out to be men of straw. On the other hand, an increase was visible in the "Water" and "Fittings" accounts, as shown in the report circulated. He trusted the company might continue to progress and flourish, and, in conclusion, begged to propose that the report of the directors, and engineer and manager, as printed and circulated, be adopted, and entered on the minutes.

The Rev. G. B. F. POTTICARY seconded the motion, which was put, and carried unanimously.

Mr. EADEN then proposed—"That a dividend on the consolidated stock and on the first call upon the new £2 shares, for the half year ending January 6, 1875, at the rate of 10 per cent. per annum, be paid on the 1st day of March next, free of income-tax."

Mr. C. E. BROWN seconded the resolution, which was unanimously carried.

The retiring directors were re-elected, and the meeting then proceeded to elect an auditor, *vice* Mr. Dennis, who had retired.

Three gentlemen were proposed for the office—Messrs. Deck, James Nutter, and C. E. Browne. The latter gentleman was ultimately elected.

A vote of thanks to the chairman concluded the proceedings.

BATH GAS COMPANY.

OPPOSITION OF THE CORPORATION TO THE NEW BILL.

A Special Meeting of the Bath Town Council was held on the 25th ult., to receive and consider a report from the committee appointed to consider and report upon the new bill of the Bath Gaslight and Coke Company.

The MAYOR (Admiral Paynter) presided, and, having stated the object of the meeting, he glanced at the various protecting clauses which he thought ought to be introduced into the new bill. In the first place, the council should take care that there was no infringement of the rights enjoyed under previous Acts of Parliament. They wanted to be sure that the maximum sum of £3 for the street-lamps, and of 3s. 9d. per 1000 cubic feet to private consumers, shall not be exceeded. They had also a right to demand that the illuminating power shall be 16 candles, and be tested by prescribed burners, known as Sugg's "London" Argand burner. They must also have the purity of the gas tested, so that the lungs, goods, and libraries of the consumers should not be damaged by sulphuretted hydrogen and ammonia. He thought, likewise, they should demand that the pressure during the day should not be less than 8-10ths, and during the night not less than 10-10ths. Further, that in any extensions beyond the boundary of the borough, the company shall take care that they have a return of 7 per cent., so that the prospective reduction in the price the public are entitled to may not be jeopardized.

The TOWN-CLERK read the subjoined report of the committee:—

Your committee has with great care examined and considered the provisions of the new bill, and regrets to report that there are several provisions inserted in and omitted from the scheme which are or may become prejudicial, as well to the rights of the corporation as to those of the private consumer.

Your committee, in the hope of amicably adjusting the points in difference, frankly submitted a statement of some objections to the new bill to the company, and suggested a conference upon the whole question between the directors and your committee. Not only was each one of the amendments requested by your committee rejected, but the suggested conference was also declined. Finding itself thus treated, your committee had no alternative but to obtain advice as to the *locus standi* of the corporation to oppose the bill, and the strict legal bearing of the matter in dispute.

Your committee is advised that upon all the questions the corporation has a *locus standi*, and that at the instance of the municipal corporation the Legislature usually insists on the insertion of provisions corresponding to most of those which have been suggested by your committee. Having regard to the somewhat peculiar circumstances of the case, your committee feels that it would be unadvisable to state publicly the exact objections to the present scheme, and the legal and other reasons by which the same was justified, and hopes that the council will be satisfied that your committee has acted with discretion as well as zeal. It may be mentioned, however, that some of the objects of your committee were to ensure a due and progressive reduction in the price of gas to the public lamps and to the private consumer, a higher illuminating standard, a higher and better regulated pressure, and the freedom of the gas supplied from the foul and fœtid odours which some weeks back created so much dissatisfaction in the city.

Your committee recommends that a petition be presented in opposition to the bill, with the twofold object of insisting upon the alterations which now appear necessary for the protection of the corporation and the private consumer, and of preventing other alterations being made in the bill during its progress through Parliament, which might in themselves be objectionable.

Your committee trusts that little more than the presentation of the petition will be necessary to induce the directors of the gas company to consider more favourably the claims of so large a consumer as the corporation and of their fellow-citizens.

Your committee recommends that the town-clerk be instructed to prepare and seal an appointment of himself as proxy to vote on behalf of the corporation in the event of the ratepayers being polled under the Borough Funds Act, 1872.

Mr. T. W. GIBBS moved that the report be received and considered, and stated that the committee, having arrived at certain conclusions, were desirous of a conference with the directors of the company in the hope of arriving at an amicable understanding. These overtures were, however, rejected, and they were driven then to take the course the committee now recommended in order to assist the relations between themselves and the gas company.

Mr. TITLEY seconded the motion, which was carried *nem. con.*

Alderman LEWIS then moved—"That a petition to Parliament be presented by the Town Council, acting as consumers of gas in the borough, as the representative of the private consumers of gas, and as tenants of land sought to be taken, for leave to be heard against the bill, and that, if necessary, the bill be opposed in accordance with such petition, and that such steps be taken in the matter as the committee of the council appointed to consider the bill may deem necessary or advisable." Having expressed the hope that the directors would reconsider their decision on the question of a conference, the mover said the suggestion of the committee with regard to the bill might be classed under three heads—first, security that the maximum price of gas shall not be exceeded in the future; secondly, security that the manufacture of gas shall not be brought nearer to the city than at present; thirdly, new regulations as to quality, quantity, and purity of the gas.

Mr. HEYWOOD seconded the resolution, which was supported by Alderman CHAFFIN and Alderman JOLLY, and Mr. EDWARDS, who deprecated the course taken by the company with reference to the proposed conference.

Mr. NEWNHAM, on the other hand, urged the council not to incur the cost of opposing the bill, seeing how well the city was lighted by the company.

Alderman LEWIS, at the close of the discussion, stated that the directors had changed their minds, and were now willing to meet the council in conference, which would be held on Friday.

When the division took place, the members holding shares in the gas company abstained from voting; but, in spite of this deduction, 37 members voted for the motion to oppose the bill, and only three against it. The resolution was carried, therefore, by an absolute majority of the council, as required by the Borough Funds Act, 1872, but before it can be acted on it will have to be ratified at a public meeting of the burgesses.

POLLUTION OF THE MANCHESTER RIVERS.

At the Ordinary Meeting of the Manchester Literary and Philosophical Society, on Tuesday, Jan. 12—R. ANGUS SMITH, Ph.D., F.R.S., vice-president, in the chair,

Mr. E. W. BINNEY, F.R.S., V.P., read a paper on this subject. He said that, at the present time, great attention was being paid to the sewerage of towns. The Corporation of Manchester had brought before the public a plan for dealing with the flood waters of the Medlock, and it is generally understood that Parliament will attempt to do something to prevent the further fouling of streams. Both Parliament and corporate bodies have been long in moving in this matter, and the doing of that which should have been done 30 years ago will now be a matter of the greatest difficulty. In 1840 the Irwell approached Salford in so pure a state that numerous fish were seen in its waters near the present Peel Park, but, after Manchester and Salford sewers had entered it, none were to be met with in it at Cornbrook. Fish were also at that time in the Medlock above Pin Mill Bridge.

In order to show how long a time authorities take to consider before they trouble themselves with action, he brought up a report on the streams of Manchester, published by Dr. Lyon Playfair, in the Health of Towns Commission in 1844. After describing the geology, water-sheddings, and streams of the district, the report proceeds as follows:—"When the boroughs of Manchester and Salford were not so thickly populated as at present and the surface of the soil was in its primeval condition, without any irregularities arising from artificial excavations, since caused by the making of bricks and for other economical purposes, the sites of the towns, from their undulating surfaces alone, would possess good top drainage into the streams and rivulets before mentioned. Some little obstruction to the drainage might arise from the rows of cottages, which are generally built nearly at right angles to the inclinations of the surface of the land; still the irregularities produced by the hand of man have doubtless been in part rectified by public sewering into the watercourses above alluded to; and had such watercourses been allowed to pass unimpeded through the towns, although they might have caused some nuisances, still they would not be in anything like the filthy condition which they are now, owing to the weirs and dams marked X in map appended to this report that stop their courses and form so many cesspools, allowing some of the top waters certainly to flow along, but collecting all the heavier particles, and thus continually generating the most offensive effluvia.

"The river Irwell, after having, by its tributaries, afforded drainage and sewerage to the towns of Bolton, Heywood, Bury, Rochdale, Radcliffe, and numerous other places, and having been pent up in countless reservoirs and dams for manufacturing purposes, approaches Salford by the Adelphi in a pretty tolerable condition as to purity, inasmuch as small fish live in its waters—a very rare circumstance in any other of the streams hereinafter mentioned. At the Adelphi is a high weir built right across the river. After passing this impediment, the stream is polluted by numerous works upon its banks and the contents of the sewers of the eastern and south-eastern parts of Salford until it receives the waters of the Irk at Hunt's Bank in a much worse condition than its own—in fact, as filthy as water can well be. Thence the river flows sluggishly along the western part of Manchester to Hulme, where it receives a portion of the waters of the Medlock and Shooter's Brook (a part of this being kept in the Bridgewater Canal), charged with the contents of the sewers of the eastern and southern parts of Manchester; it is then stopped at Throstle Nest by a dam across its stream. For many miles in its course towards Runcorn it emits offensive smells, and bubbles of light carburetted hydrogen gas rise to its surface.

"The Irk approaches Manchester from Blackley. It, like the Irwell, is anything but a pure stream to begin with. After being dammed up at Messrs. Appleton's paper-mills, Mr. Hartley's dye-works, Mrs. Crompton's paper-mill, and Messrs. Appleton's upper logwood-mills, it joins the Moston Brook at Collyhurst. This last-named brook is impeded in its course, within a quarter of a mile of its junction, by three weirs—namely, at Messrs. Appleton's St. George's logwood-mills, Messrs. Dentith and Co.'s chemical works, and a weir not far from the old Rochdale Road, at Collyhurst. Proceeding with the Irk, this river, after its junction with the Moston Brook, is dammed up at Messrs. Appleton's lower logwood-mills and near the Bull's Head Inn, in Newtown; and after receiving the refuse from the numerous dye-works, size manufactories, chemical works, tanneries, skin-yards, gas-works, sewers, &c., it is stopped at Messrs. Caistor and Thompson's corn-mill, at Scotland Bridge, and the School Mills, in Long Millgate, before it reaches the Irwell at Hunt's Bank.

"The Medlock enters the borough at Beswick charged with the refuse of numerous works, and is dammed up by weirs across its course at Messrs. Guest's weir at Beswick, Neck Break weir, the Island Mill weir (a little below which, near Fairfield Street, it receives some fœtid water from a small dam at Cruickshank's mill), Messrs. Hoyle's weirs in Ardwick, and the weir near Messrs. Wood and Westhead's mill in Garratt. At this place it receives the water of Shooter's Brook, a filthy little stream, as black as ink, which enters Bradford from Newton, and after flowing under Butler Street to New Islington exposed, is covered in till it reaches the Medlock at Garratt. This last-named stream, after its junction with Shooter's Brook, passes under Oxford Road, along Little Ireland, and is dammed up near Messrs. Birley's mill, in Kenyon Street. It then receives many sewers from the surrounding district, and the river Tib, in Gaythorn, which runs under the centre of Manchester, but is entirely built over, and reaches the Duke of Bridgewater's Canal in as polluted a state as possible; thence some of its water, after being employed as a power of winding goods, escapes into its old course, which joins the Irwell near Hulme Hall. The waters of the Duke of Bridgewater's Canal are chiefly derived from the Medlock, after it has received the contents of the Manchester sewers, and thus are in as bad a condition as the streams before described.

"Cornbrook enters Ardwick from Gorton, and, partly open and partly built over, traverses Ardwick, Chorlton-upon-Medlock, Greenheys, Hulme, and Cornbrook, at which last-mentioned place it reaches the Irwell in as polluted a state as any of the other streams.

"Besides the streams before described, I may mention a little rivulet near Stock Street, in Cheetham, which crosses York Street, and after forming several

stagnant ponds, enters the reservoir in Strangeways Park. There is also another rivulet, which crosses the New Bury Road at Stocks, and flows down to the pool near Strangeways Hall. A third goes from Cheetwood, by the end of Broughton Lane, and a fourth by Broughton Grove. All these run into the Irwell. There is also a filthy and stagnant pool of water in front of the houses at Stony Knolls, which excites very little attention among the inhabitants. In Pendleton there is a small stream, which, though it has often been presented at the court leets as a nuisance, and is correctly designated "The Black Ditch," remains in just as bad a condition as it ever did. In all the streams above described a number of dead dogs and cats are to be seen in the various states of decomposition, bubbles of gas (light carburetted hydrogen) rise up to the surface, and although offensive smells are met with at all times, they are by far the most annoying when the barometer has experienced a sudden depression after having been high for a considerable time previously. Sulphuretted hydrogen is the gas which chiefly causes the odour, though, doubtless, phosphoretted hydrogen assists in some measure."

Such was the condition of the Manchester streams prior to 1844. Immediately after the publication of the Health of Towns Commissioners Report, the sewerage of towns and villages was increased to a great extent; and in nearly all cases the refuse matter was conveyed into the neighbouring streams, instead of being utilized in manuring the land, as it had been previously employed. No doubt sanitary engineers have been the chief offenders in polluting our waters during the last 30 years, but manufacturers have also done their share by disposing of their refuse matter into the streams. The consequence is that not only are the waters more polluted, but their beds are being continually raised. Single towns on the banks of streams have little power to alter matters, there are so many vested interests to be dealt with. Numerous owners of property have by law what is called a right to foul waters by long user, and it will require strong parliamentary powers to effect any good. The owners of the numerous weirs will have to be compensated prior to such obstructions being removed, and allowing the waters of the streams to flow and cut their courses as they once did. Before any great engineering works in the making of tunnels are attempted, it is only reasonable that the streams should have a fair chance to cleanse themselves by their own natural flow of water. Manchester and Salford could try what the removal of the weirs at Douglas Mill, the Adelphi, and Throstle Nest would do. Surely such a simple experiment is worth trying before hundreds of thousands of pounds are spent in forming tunnels.

However, let Manchester and Salford spend what money they may, little good will be done unless the pollution of the waters above from their sources downwards to those towns is stopped. No doubt those towns set a bad example in the beginning, but as all the places on the streams are more or less guilty, they ought all to make a fair start together in the race of amending their evil ways of fouling streams and wasting manure.

If once the fœcal matter of a large town is diluted with water, it is very costly to get it back again, either by evaporation or sewage farming. Rival patentees advertise and recommend their respective plans as most efficacious, but at the present time he was not aware of the whole of the sewage waters of any large town in England having been profitably applied for farming purposes.

In consequence of a resolution passed at a meeting of gentlemen representing the Corporations of Manchester and Salford, on the 23rd of December, 1874, a meeting of representatives of the Corporations of Manchester and Salford, and of a large number of the local authorities of the district, was held on Wednesday last, in the City Council Chamber, for the purpose of considering generally as to what steps it may appear expedient to take in relation to the subject of rivers pollution, and for the purpose of ascertaining to what extent such local authorities will be prepared to co-operate with the Corporations of Manchester and Salford, in urging upon the Government the necessity for legislation, with a view to the prevention, so far as may be practicable, of the continued pollution of rivers. There was a large number of gentlemen present, representing various local boards and other corporate bodies. The MAYOR of MANCHESTER (Alderman King) presided; and the Mayor (Alderman Harwood) and the Town-Clerk (Mr. Moorhouse) of Salford were among those present.

The following places were represented:—Manchester, Salford, Crumpsall, Newton Heath, Hyde, Rochdale, Stalybridge, Chorlton-cum-Hardy, Rusholme, Bradford, Stretford, Swinton and Pendlebury, Moor Side, Barton-upon-Irwell, Eccles, Oldham, Prestwich, Warrington, Pennington, Bedford-Leigh, Gorton, West Leigh, Littleborough, and Bolton.

The TOWN-CLERK of Manchester (Sir J. Heron) having explained the purposes of the meeting.

The MAYOR of Salford proposed a resolution in favour of applying to Government to introduce a bill to prevent the pollution of rivers, which was seconded by Mr. V. K. ARMITAGE.

The TOWN-CLERK of Manchester said some time ago a deputation consisting of representatives from the borough of Salford, and, he believed, from Warrington and other places, waited upon the Secretary of State on this subject. Subsequently a circular was sent out, dated Aug. 23, 1874, explaining the object of the deputation, and a copy of the memorial sent to Mr. Cross was transmitted with it, and all the local boards were invited to send deputations to a meeting. Mr. Cross, in reply to the memorial, expressed his appreciation of the importance of the subject, and promised that if a united representation were made to the Government by the sanitary authorities on the banks of the river, he would carefully consider the question, with the object of complying with the request. The general object of the memorial presented to Mr. Cross was to take such measures as Her Majesty's Government might deem necessary to effect the recommendations of Her Majesty's Commissioners for inquiring into the pollution of rivers for the conservancy of the river Irwell by the formation of a conservancy board for the whole watershed of the Irwell. The objects which had been set forth in the circular were, first, to prevent solid matter being cast or allowed to go into a river; second, to prevent sewage going into a river; and third, to prevent the river being polluted by the various works situated on its banks. It was desirable that the meeting should understand what were the recommendations of the Rivers Pollution Commissioners, because it might be assumed that the Government, when legislating on the subject, would do so to a large extent in the direction indicated by the commissioners report. Their last report contained a recommendation which appeared to be a summing up of the many volumes of reports which they had previously published. Their recommendation was to this effect:—"We are of opinion that any law having for its object the prevention of river pollution should first absolutely forbid, under adequate penalties, the casting of solid matters into river channels." The second recommendation was to the effect that the foregoing standards of purity should be those below which any liquid discharged into the watercourses should, with the exception already mentioned, be forbidden. He might suggest, in passing, that the standard of purity was not a subject for discussion at that meeting. They might assume that the legislation carried out would be on some reasonable principle, and that the standard of purity to be fixed was such as could really be complied with by all parties interested. The next recommendation was rather important, though he confessed that he did not understand it. It gave power to all manufacturers in towns—what was to become of the poor manufacturer out of town the commissioners did not say—but to all manufacturers in towns, except those of gas—those were beyond all means of redemption, and were excluded from all consideration—except those of gas, paraffin oil, pyroligneous acid, animal charcoal, tin plate, and galvanized iron. The privilege accorded to all other manufacturers in towns was denied to those, but all others were permitted to discharge their drainage waters into the town sewers under suitable regulations. The commissioners also expressed their opinion that the object in view would be best secured by the appointment of inspectors, to whom should be committed the duty of detecting and proving offences against the law, and of procuring the conviction of offenders; and that, in order to secure the independence of those inspectors from local influence, they should hold their offices from Her Majesty's Government. Those were practically the recommendations in the committee's report which more immediately affected the object of the gentlemen assembled at the meeting.

The MAYOR said the great point seemed to be how far the various corporations were prepared to unite in asking the Government to take some steps in this matter. It was clear that there was no use in any one corporation on the banks of the Irwell undertaking to cleanse it, unless all the other corporations joined them.

The MAYOR of Salford proposed a resolution to the effect that steps be taken to urge upon the Government the necessity of remedial legislation for the prevention of river pollution. He said they all felt the time was come when it was most necessary to abate a disgraceful and abominable nuisance, and they should consider what steps should be taken to induce the Government to bring in a bill during the present session. The Secretary of State had given him to understand that the Government could not legislate for one river, but must bring forward a bill to embrace the whole of England. He hoped such a resolution would be passed by that meeting as would make an impression on the Government, and convince them of the necessity of taking effectual steps for the prevention of river pollution.

Mr. V. K. ARMITAGE seconded the resolution, and said the people of Salford were terrible sufferers from the present state of the river Irwell. It appeared from the report of the commissioners on the subject that from the rise of the Irwell to Agecroft Bridge the fall was 40 feet per mile, while from thence to below Salford it averaged 3 feet 7 inches per mile. The necessary result was that the rubbish deposited in the upper portion was carried down, but when it was brought to where the fall was so much less, it stopped and accumulated there. The result was that the bed of the river was silting up at a terrible rate, and the Irk and the Medlock were silting up to even a greater extent. The Bridgewater Trustees had obtained an Act, at a cost of £12,000, empowering them to prevent parties from throwing solid matter into the river, but it proved inoperative, because it only gave the power to prevent the matter being thrown into the river, and the parties interested evaded the provision by depositing the matter on the banks in situations where it was sure to be carried away by the next flood. This rendered the nuisance worse than before, for whereas before the matter came down the river by degrees, it now came down in a body whenever a rise took place in the river. The Bridgewater people were now paying something like £2000 a year to keep the river sufficiently deep for them to float their barges in. What the people of Salford would desire was a conservancy board, or some other authority which would have control over the whole watershed of the Irwell.

Alderman WALMSLEY, chairman of the Salford Health Committee, said the pecuniary cost of the proposed legislation should not be so much considered as the public health, for the most costly thing a nation possessed was the life and blood and work of the population.

The TOWN-CLERK of Manchester suggested the adoption of the following resolution, in place of the one proposed by the Mayor of Salford:—"That, in the opinion of this meeting, further delay ought not to be permitted in taking the steps necessary for preventing, as far as may be practicable, the continued pollution of the rivers and streams of this country; that this meeting is fully aware of the enormous difficulties with which the whole question is surrounded, and the responsibility which necessarily attaches to any local authority who may concur in the representations proposed being made upon this subject to Her Majesty's Government; but, in their opinion, no effective steps will be taken, either by local authorities or by traders, until it is fully understood and seen that Her Majesty's Government is prepared to promote legislation for the purpose of carrying out, to the extent that they may consider practicable or desirable, the recommendations made by the Rivers Pollution Commissioners."

The MAYOR of Salford accepted the resolution suggested by the town-clerk in place of his own, and it having been seconded by Mr. BIRCH, it was, after some discussion, unanimously adopted.

A deputation was then appointed to wait on the Secretary of State, and the proceedings terminated with a vote of thanks to the Mayor of Manchester for presiding.

THE BIRMINGHAM SEWAGE DIFFICULTY.—SETTLEMENT OF THE DISPUTE BETWEEN SIR CHARLES ADDERLEY AND THE CORPORATION.—We are enabled to state that an arrangement has been made (subject, of course, to the approval of the Town Council) by which the long-pending litigation between Sir Charles Adderley and the Corporation of Birmingham will be brought to a close. It was reported to the Town Council, some time ago, that Sir Charles Adderley claimed compensation for damage done to his property by the fouling of the river Tame, through sewage, and that he had given notice of an intention to prosecute the claim without delay. The case was to have been heard next week; but an arrangement has now been made between Sir Charles Adderley and the Sewage Committee which, if approved by the Town Council, will dispose of the matter. It is agreed that the corporation shall pay Sir Charles Adderley £6000, as compensation for past damage, he reserving his right to take further proceedings in case of additional damage in the future. On his part, Sir Charles Adderley agrees to withdraw from the proceedings now pending in Vice-Chancellor Bacon's court against the corporation, in reference to the pollution of the Tame by sewage, and he assents to the existing order of sequestration being discharged. If these terms are approved, a litigation which has lasted, on and off, for about fifteen years will be at an end, and we hope will not be renewed at any future period, the corporation having given abundant proof of their desire to meet all practicable requirements in reference to the disposal of the town sewage. A report on the subject will, we understand, be presented by the Sewage Committee at the Town Council meeting this day.—*Birmingham Daily Post.*

STAFFORD WATER SUPPLY.—A meeting of householders was held on the 25th ult., the mayor presiding, for the purpose of considering a proposal of the Town Council to bore for water on Stafford Common for the supply of the inhabitants. Mr. Day explained the position of the question. He said that, although he had not been satisfied that Stafford required water-works, yet, in the face of the steps taken by two separate companies which were applying for parliamentary powers, he saw no escape from the snares of speculators, except by adopting some course such as the one now proposed. He believed that property-owners had the remedy in their own hands, for he had no doubt that good water lay underneath the whole town, and it only required better sanitary arrangements to free it from contamination; but as the council possessed no compulsory power which could deal with them, property-owners whose houses were ill supplied with water could put them at defiance. One of the schemes with which they were threatened proposed to raise £60,000 in shares, and £15,000 by borrowing. To make such an investment remunerative in a small town like Stafford would necessitate a very heavy water-rent, and as he had been assured by Mr. Dale, the engineer, that, in obtaining water from Stafford Common, the cost would certainly not reach a quarter of the sum spoken of, he had no alternative but to support the scheme which the meeting had before it. The engineer referred to had visited the site, and had pronounced it in every way suitable, affirming that the water would be of the best description for domestic use, and abundant in quantity. He concluded by moving that the necessary permission be granted. The motion was seconded by Mr. Holder, and carried by a large majority.

ON THE QUANTITATIVE ANALYSIS OF THE NITROUS ACID CONTAINED IN POTABLE WATERS.

By M. FERDINAND FISCHER.

[Translated from the *Moniteur Scientifique*.]

In order to ascertain the presence of nitrous acid in a liquid, Mr. D. Price (*Pharmaceutical Journal*, Oct., 1851) poured into it some starch-paste, a few drops of a solution of iodide of potassium, and dilute hydrochloric acid. The presence of one milligramme of nitrous acid in a litre of water sufficed to produce at once a violet colour; two-tenths of a milligramme produced a similar result, but not until after several minutes had elapsed.

Schoenbein (*Journal für Praktische Chemie*, vol. lxxxiv., p. 227) added to a liquid some starch prepared with iodide of potassium (consisting of one part of the iodide, 20 parts of the starch, and 500 parts of water) and dilute sulphuric acid, and, according to him, this reagent is sufficiently sensitive to indicate the presence in a liquid of a millionth part of nitrous acid.

Lersch (*Zeitschrift für Analytische Chemie*, vol. i., p. 244) has proved by this method that the hot baths of Burtscheid, near Aix-la-Chapelle, contain nitrous acid; but he believes this acid was not originally present in the water. On the contrary, it would be formed, when the water is stored, by the reduction of the nitrates or the oxidation of the ammonia.

Trommsdorff (*Ibid.*, vols. viii., p. 358; ix., p. 168) follows the precept of Richter. He raises to boiling point a mixture of 5 grammes of starch, 20 grammes of chloride of zinc ($Zn Cl_2$), and 100 cubic centimètres of water, and keeps it at this temperature for several hours, replacing the quantity of water lost by evaporation; he then adds 2 grammes of iodide of zinc ($Zn I_2$), dilutes the mixture till it measures one litre, and filters. If kept in a dark place, this solution will show no signs of decomposition for a considerable time. If to 50 cubic centimètres of water be added one cubic centimètre of dilute sulphuric acid and a similar quantity of this starch mixture, a blue colour will result, similar to that produced in a solution of nitrite of potash, the standard of which is known.

Kaemmerer (*Ibid.*, vol. xii., p. 377) states that erroneous results may be obtained when sulphuric acid is employed for acidulating, inasmuch as the organic acids of the water reduce the liberated nitric acid to the condition of nitrous acid. He, therefore, acidulates with acetic acid.

Eby (*Ibid.*, vol. xii., p. 379) is of opinion that when starch, iodide of zinc, and dilute sulphuric acid are employed, the formation of iodide of starch is generally attributable rather to the presence of a very fine humate of iron held in suspension, than to the presence of a nitrite.

The author of the present paper has already had occasion, at various times, to analyze waters taken from ferruginous turf-pits, and he has found that when they have been treated with starch, iodide of potassium, and sulphuric acid they have shown no signs of colouration, even after the lapse of an hour. A similar result has been obtained with water from another spring, which issued with considerable force at the outlet, and discoloured, to the extent of 50 per cent., more than its own volume of permanganate of potash. Chloride of lithium, placed in the neighbouring spring, appeared in the other water at the end of 12 hours, its presence being clearly traceable by spectral analysis.

As the foregoing experiment did not accord with the observations of Kaemmerer and Eby, nitrate of potash was added to some distilled water containing 5 per cent. of urine, and likewise to some ferruginous water, highly coloured, which had been taken from a turf-pit. Both these waters were tested for nitrous acid, and in the second case this was done previous to the addition of the nitrate. For this purpose 50 cubic centimètres of the water were poured into a cylinder, and to it were added 1 cubic centimètre of starch-paste, ·5 cubic centimètre of solution of iodide of potassium, and 1 cubic centimètre of dilute sulphuric acid, hydrochloric acid, and concentrated acetic acid. The gradations of colour were observed by looking through the bed of the liquid (which was about 15 cubic centimètres thick) at a piece of white paper, allowing the eye to travel from top to bottom. The results of these researches are set out in the following table:—

One litre of liquid was mixed with—		Distilled Water.				Distilled Water containing 5 per Cent. of Urine.				Water taken from a Turf-Pit.			
		Number of Minutes before Reaction was visible.		Number of Minutes before the Water became cloudy.		Number of Minutes before Reaction was visible.		Number of Minutes before the Water became cloudy.		Number of Minutes before Reaction was visible.		Number of Minutes before the Water became cloudy.	
		Min.	Colouration.	Min.	Colouration.	Min.	Colouration.	Min.	Colouration.	Min.	Colouration.	Min.	Colouration.
	Sulphuric acid	..	..	..	..	..	..	..	..	70	Violet.	..	..
	Hydrochloric acid	..	..	..	..	..	..	..	..	120	Ditto.	..	..
	Acetic acid	..	..	..	..	..	..	..	..	..	..	..	..
·213 gramme KNO_3.	Sulphuric acid	10	Pale violet.	80	Blue-violet.	..	..	..	..	6	Pale violet.	90	Blue-violet.
	Hydrochloric acid	12	Ditto.	..	..	..	..	..	..	10	Ditto.	..	..
	Acetic acid	..	..	..	..	..	..	..	..	..	..	..	..
·426 gramme KNO_3.	Sulphuric acid	1	Violet.	6	Blue-violet.	180	Pale violet.	..	..	1	Violet.	8	Blue-violet.
	Hydrochloric acid	2	Ditto.	40	Dark blue.	..	..	..	..	2	Ditto.	30	Blue.
	Acetic acid	120	Pale violet.	30	Blue-violet.	..	..	..	..	180	Very faint.	30	Blue-violet.
2·125 grammes KNO_3.	Sulphuric acid	*	Blue.	*	..	*	Blue.	*	..	*	Blue.	*	..
	Hydrochloric acid	*	Violet.	2	Blue.	*	Violet.	6	Blue.	*	Violet.	3	Blue-violet.
	Acetic acid	15	Pale violet.	150	Blue-violet.	60	Pale violet.	200	Violet.	40	Pale violet.	160	Ditto.

In the cases marked * the colouration took place immediately.

Kaemmerer's process, therefore, is found to be impracticable on account of its insufficient sensitivenes; while the colorometric method of Trommsdorff is scarcely to be relied upon for exactness, inasmuch as the presence of organic matters, notably those of animal origin, in the water, considerably retards the reaction, and even at times altogether prevents its appearance. In another experiment made with water taken from a spring exempt from nitrite, but containing nitric acid and mixed with urine, it gave on the following day a very strong reaction of nitrous acid, evidently due to the reduction of the nitrate. When water is acidulated with hydrochloric acid, the reaction is less apparent than when sulphuric acid is employed; but it is much more exact, as it sometimes happens that this latter acid separates the pure iodine of the iodide of potassium. (Mohr. *Titrirmethode*, 4th ed., p. 343.)

Lersch (*Zeitschrift für Analytische Chemie*, vol. i., p. 244) has stated that the waters of Burtscheid, when acidulated with sulphuric acid, produce a distillate, a few drops of which suffice to form blue iodide of starch; and Wildenstein (*Ibid.*, vol. i., p. 245) has proved that the matter which caused the decomposition of the iodide of potassium was in reality nitrous acid. The distillate, exempt from chloride, discoloured the permanganate of potash, and produced with sulphate of iron the well-known brown colour. Now Fresenius (*Ibid.*, vol. xii., p. 428) proves that when a little acetic acid is added to a solution containing not more than about 6 milligrammes of nitrous acid per litre, this acid distils without decomposition, and its quantitative analysis may be very accurately made in the distilled liquid by the aid of permanganate of potash.

Feldhaus (*Ibid.*, vol. i., p. 426) was the first to employ manganate of potassium in an acid solution very much diluted for testing for nitrous acid; one cubic centimètre of normal permanganate corresponding to ·5 equivalent in milligrammes = 19 milligrammes N_2O_5 (NO_5), and to 42·5 milligrammes of KNO_3 ($KO NO_5$). This process has been perfected by Gille (*Journal für Praktische Chemie*, vol. lxxiii., p. 473) and by Kubel (*Ibid.*, vol. cii., p. 229; also in *Anleitung zür Untersuchung von Wasser*, p. 75), and adapted to the analysis of water. One hundred cubic centimètres of water are mixed with 5 cubic centimètres of dilute sulphuric acid, discoloured by the solution of iron retitrated by the manganate of potassium.

In order to verify these indications, one litre of distilled water was taken, and 5 per cent. of urine added to it; also water from a turf-pit, and 10 or 100 cubic centimètres of a solution of nitrite of potash; 200 cubic centimètres of this solution were acidulated with acetic acid, and about 100 were distilled and titrated by manganate of potash. The residue from the distillation did not give any reaction of nitrous acid. Moreover, 200 cubic centimètres of the solution were mixed with 5 cubic centimètres of dilute sulphuric acid and manganate of potassium, to the extent of 50 per cent., until it attained a deep red colour; it was then decolourized with ammoniacal sulphate of iron, and retitrated with the manganate to a pale red. The quantities of permanganate required for 200 cubic centimètres were as follows:—

	Before Distillation. Cubic Centimètres.		Milligrammes.	The Distillate. Cubic Centimètres.		Milligrammes.
Pure solution	4·54	=	3·859 KNO_2	4·50	=	3·825 KNO_2
With urine	29·55		—	3·92	=	3·332 „
With peat	8·90		—	3·80	=	3·230 „
Pure solution	0·50	=	0·425 „	0·45	=	0·383 „
				0·42	=	0·357 „
With urine	20·50		—	0·25	=	0·213 „
With peat	4·85		—	0·32	=	0·272 „
Pure solution	8·87	=	7·539 „	8·34	=	7·089 „

Kubel's process is, therefore, totally inefficient in presence of easily decomposable organic matters; distillation by acetic acid, recommended by Fresenius, gives, on the contrary, very good results. The sensitiveness of the latter method is remarkable; 20 cubic centimètres of a solution of pure nitrite of potash contained only ·213 milligramme of KNO_2, and in presence of the starch and iodide of potassium, it showed at the end of 10 minutes only a faint violet colouration. It was then diluted with 200 cubic centimètres of water, and acidulated with acetic acid and submitted to distillation. The first two cubic centimètres distilled were treated with starch and iodide of potassium and dilute sulphuric acid. At the end of five minutes a violet colour appeared; at the end of 40 minutes a dark blue.

Two hundred cubic centimètres of spring water, acidulated with acetic acid, presented no colouration of iodine, even at the end of six hours; acidulated with sulphuric acid, the liquid only showed a faint violet colouration at the end of 10 minutes. The water was then distilled with 2 cubic centimètres of acetic acid. The first 3 cubic centimètres distilled were mixed with starch and iodide of potassium and hydrochloric acid. At the end of three minutes a blue-violet colouration appeared; at the end of 30 minutes a dark blue.

As in distilling with acetic acid the nitrite only is decomposed, this process is not only *the most exact*, but *the most sensitive* of all those at present known.

Schoenbein (*Zeitschrift für Analytische Chemie*, vol. i., p. 319) advises the acidulation with dilute nitric acid, with the addition of pyrotannic acid, of any water to be tested for the presence of nitrites; the nitrous acid turns the liquid a brown colour. It will be seen that this method offers no special advantage; it is much less sensitive than that in which the iodurette starch is employed, and, besides, has never been in general use.

E. Kopp (*Jahresbericht des Physikalischen Vereines zu Frankfurt*, 1873, p. 19) mixes about 2 cubic centimètres of a solution of diphenylamine in concentrated sulphuric acid with a few drops of the water to be analyzed; if it contain but slight traces of a nitrous or nitric combination, a beautiful azure-blue colouration will be almost instantaneously produced. As the nitrate gives a similar reaction, this process cannot be employed in testing for nitrous acid in spring water.

Griess (*Liebig's Annalen der Chemie*, vol. cliv., p. 333; also *Zeitschrift für Analytische Chemie*, vol. x., p. 42) mixes 100 cubic centimètres of water with ·5 cubic centimètre of a solution saturated in a cold state with diamidabenzoic acid, and acidulated with sulphuric acid. If the liquid contain nitrous acid, it will acquire, after a lapse of from 10 to 15 minutes, a more or less intense yellow colour. Titration is effected by comparison with solutions whose standard is already known.

Mohr (*Titrirmethode*, 4th ed., p. 343) uses a solution of iodide of potassium with dilute hydrochloric acid and starch, and measures the colouration with the 100th part of hyposulphite of sodium.

These methods are neither so sensitive nor so exact as that in which distillation is effected with acetic acid, inasmuch as they are influenced by the presence of organic matters.

The following is the method generally found to be most suitable for making ordinary analyses of spring water used for the supply of towns. Fifty cubic centimètres of water freshly drawn are mixed in a glass cylinder with 1 cubic centimètre of dilute hydrochloric acid, ·5 cubic centimètre of a solution of iodide of potassium, and 1 cubic centimètre of starch. If several analyses have to be made, starch of iodide of zinc may also be advantageously employed. This liquid is shaken, and the resulting colouration is observed by looking from top to bottom through the bed of the liquid, which is from 12 to 15 centimètres thick. Three kinds of titrations are observable. The first, which may be called No. 1, is that which assumes a violet colour in from 10 to 15 minutes; No. 2 is that in which the violet colour is instantaneously produced; and No. 3, that in which the mixture assumes at once the blue colour.

If, in the trial which has been indicated above, the violet colouration do not appear at the end of 15 minutes, or if that colouration be but slight, from 250 to 500 cubic centimètres of water should be acidulated with acetic acid and distilled. To the first 3 or 4 cubic centimètres submitted to distillation a drop of dilute hydrochloric acid is added, a small quantity of starch, and two or

three drops of solution of iodide of potassium. Very faint traces of nitrous acid in the water suffice to produce a blue or violet colouration.

On the other hand, if in the preliminary trial the colouration be blue-violet or blue, from 100 to 150 cubic centimètres of water should be distilled, acidulated with pure dilute sulphuric acid, and 1-50th part of manganate of potassium added, until at the end of 10 minutes the liquid shows a faint red colour.

One cubic centimètre of permanganate to 1-50th corresponds to ·01 equivalent in milligrammes = ·38 mgr. N_2O_5 (NO_5), to ·47 mgr. HNO_3 (HO, NO_5) or to ·85 KNO_3 (KO, NO_5).

ON NOXIOUS AND OFFENSIVE TRADES AND MANUFACTURES, WITH ESPECIAL REFERENCE TO THE BEST PRACTICABLE MEANS OF ABATING THE SEVERAL NUISANCES THEREFROM.

By H. Letheby, M.B., M.A., &c.; Professor of Chemistry in the College of the London Hospital; late Medical Officer of Health and Public Analyst for the City of London; and President of the Society of Medical Officers of Health.

[A Paper read before the Society of Medical Officers of Health, Saturday, Jan. 16, 1875.]

Amongst the nuisances defined in the various Acts of Parliament, general and local, are those occasioned by the operations of trade and industry. Sections 27 and 28 of the Amended Nuisances Removal and Diseases Prevention Acts (18 & 19 Vict., cap. 121) express in a general way the character of these nuisances and the methods of procedure in cases of default: "If any candle-house, melting-house, melting-place, or soap-house, or any slaughter-house, or any building or place for boiling offal or blood, or for boiling, burning, or crushing bones, or any manufactory, building, or place used for any trade, business, process, or manufacture causing effluvia, be at any time certified to the local authority by any medical officer, or any two legally qualified medical practitioners, to be a nuisance or injurious to the health of the inhabitants of the neighbourhood, the local authority shall direct complaint to be made before any justice, &c., for the suppression or mitigation of the nuisance complained of;" and by the Sanitary Act, 1866 (29 & 30 Vict., c. 90, s. 18), a like power of initiating proceedings is given to any ten ratepayers of the place in which such nuisance exists, on a requisition in writing to the local authority. In case of such procedure, it is necessary not only to show that the trade or business complained of "is a nuisance, or causes effluvia injurious to the health of the inhabitants of the neighbourhood," but also that the person complained against has not "used the best practicable means for abating such nuisance, or preventing or counteracting such effluvia."

It follows, therefore, that the supervision of such trades and manufactures, and the maintenance of them in such condition as that the best practicable means are constantly used to prevent the escape of offensive effluvia, forms one of the most important duties of the medical officer of health; and as, in a professional capacity, I have had occasion frequently to visit and inspect most of the manufactories belonging to this category, I have thought that a brief account of my experience in the matter might be acceptable to my professional colleagues.

And here I ought to state that, on entering upon any inquiry of this description, it is proper to keep in mind the evident intentions of the Legislature—namely, the maintenance of the public health and comfort, with due regard for the necessities of industry; for it will be observed that, although the preservation of the public health has been considered by Parliament of such paramount importance as to justify enactments containing enormous arbitrary powers, yet the exercise of those powers is always guarded with such provisoes as will prevent abuse, and, therefore, unnecessary injury to trade. It is fortunate that, in most cases, the interests of the public and the manufacturer, although apparently conflicting, are really in accordance; for that which is injurious to the public is frequently a wasteful loss to the manufacturer; and therefore the prevention of such waste by reasonable contrivances has a double advantage. This may not be apparent at first sight to the chief parties interested, for it has often happened, in the course of my professional practice, that the suggestions which I have offered for the mitigation of a nuisance have not been readily accepted by the manufacturer, although in the end they have been gratefully acknowledged. I cannot, indeed, too strongly impress upon the minds of all who are concerned in such inquiries, that there need not be a feeling of antagonism in the matter; for if at any time it exists, it is either caused by a want of confidence in the skill and technical knowledge of the professional adviser of the local authority, or by an unjust and exaggerated view of the necessity for providing for the public health and comfort at all costs. This is manifestly in opposition to the spirit of the Acts of Parliament, so far as local authorities are concerned, for their duties are to see that the best practicable or available means are adopted to prevent the escape of noxious or offensive effluvia. If that fails to abate the nuisance complained of, the parties aggrieved have their remedy at law or in equity in one of Her Majesty's superior courts. On the other hand, as Mr. Keane observes, the manufacturer is bound to use the best practicable and available means to protect the public from injury to health. It will not be enough to adopt such precautions only as are used in the place or district among persons carrying on the same business or manufacture, if it has been ascertained that there are better which are available; and in interpreting the words available and practicable, it is probable that the magistrates will pay more attention to scientific than pecuniary difficulties. It is of great importance, therefore, that the opinions of the medical officer of health should be well founded, and his recommendations free from reasonable objections, for it must not be forgotten that the manufacturer, if he thinks himself aggrieved, has the right and power of appeal from the justices to a superior court, where the knowledge and judgment of the medical officer will be severely tested.

But besides the nuisances which are caused by manufacturing operations, there are others which are more or less incidental to them, as well as to other branches of trade and industry. "Any accumulation or deposit which is a nuisance or injurious to health; or any pool, ditch, gutter, or watercourse, so foul as to be a nuisance, or injurious to health (18 & 19 Vict., c. 121, s. 8);" or "any factory, workshop, or workplace, not already under the operation of any general Act for the regulation of factories, or bakehouses, not kept in a cleanly state, or not ventilated in such a manner as to render harmless, as far as practicable, any gases, vapours, dust, or other impurities generated in the course of the work carried on therein, that are a nuisance or injurious to health;" and "any fireplace or furnace which does not, as far as practicable, consume the smoke arising from the combustible material used in such fireplace or furnace;" and "any chimney (not being the chimney of a private dwelling-house) sending forth black smoke in such quantity as to be a nuisance (29 & 30 Vict., c. 90, s. 19)"—all of which are under the supervision of the medical officer of health, with a view to legal proceedings in case of default.

Looking at the individual peculiarities of these nuisances, it is evident they may be conveniently classified under three heads—namely:

1. Those which are caused by the escape of noxious or offensive effluvia, as gases and vapours.
2. Those which are produced by smoke, dust, or other mechanical impurities.
3. Those which are occasioned by the discharge of noxious or offensive matters into gutters, ditches, or watercourses.

It will not be possible to discuss in a satisfactory manner the whole of these subjects this evening, and therefore I propose to limit your attention to the first of them—namely, to those trade nuisances which are caused by the escape of noxious and offensive effluvia, as sulphuretted hydrogen, empyreumatic or other organic vapours, and the gaseous acids.

The Manufacture of Sulphate of Ammonia.

Foremost of those operations which cause offence by the escape of sulphuretted hydrogen into the atmosphere is the manufacture of sulphate of ammonia from gas liquor. This liquor is produced in great quantity at the gas-works—varying from 10 to 40 gallons per ton of coals, according to the strength of the liquor and the perfection of the processes for removing ammonia from gas. The strength of the liquor is estimated and expressed by its gravity in degrees of Twaddell, or by the number of ounces of strong sulphuric acid (sp. gr. 1850) required to saturate a gallon of it. This varies from 5 or 6 ounces per gallon to 25 ounces, and, according to my experience, the proportion of sulphuretted hydrogen contained in it ranges from 230 grains, or rather less than one-third of a cubic foot of sulphuretted hydrogen per gallon, to rather more than 1250 grains, or nearly 2 cubic feet per gallon; so that the liquor is exceedingly offensive from the quantity of sulphuretted hydrogen contained in it; and therefore it is necessary to store it in air-tight tanks, and to transport it from place to place in air-tight vessels—as barrels or tank-barges, or tank-trucks. It is proper also that the orifices which give exit to the air at the time of filling the tanks should be guarded with a box or small barrel containing hydrated oxide of iron, which absorbs the sulphuretted hydrogen, producing sulphide of iron, which is subsequently revivified by the action of the air.

The methods of treating this liquor with sulphuric acid so as to produce sulphate of ammonia have differed at different times and places. In my early experience, even in this metropolis, the process was to neutralize the liquor with brown acid of sp. gr. 1720, and to convey the evolved gases into a furnace fire, as their escape into the air would be dangerous to the workmen; and the saturated liquor still reeking with sulphuretted hydrogen was evaporated in open lead troughs over open fires. The nuisance arising from these operations was absolutely unbearable, and, as people got to be more and more sensitive of annoyance, the old process was discontinued. At the present time the practice is to evaporate or distil the liquor from closed boilers or chambers, and to convey the volatile products—ammonia, carbonic acid, and sulphuretted hydrogen—into a closed chamber or saturator, containing weak sulphuric acid, there being a contrivance for the escape of carbonic acid and sulphuretted hydrogen, and the conveyance of them to a furnace fire. In some cases the liquor is distilled from boilers set over a common fire; but, as this is liable to flushes and irregularity in working, it is objectionable, and has given place to the process of distilling by means of a steam coil set in the boiler, by which steam at from 20 to 30 lbs. pressure is blown into the liquor. But the best contrivance of all is that known as Coffey's still, which consists of a vertical chamber from 20 to 25 feet in height, having a series of transverse septa which alternately leave openings at their ends. In this way, with about 60 of such septa, a superficial area of about 1000 square feet of evaporating surface may be obtained. The liquor is delivered in a constant and graduated stream at the top of the chamber, and, as it flows backwards and forwards in a descending current over the transverse septa, it meets with an ascending blast of steam, which is let into the bottom of the chamber at a pressure of from 15 to 30 lbs. In this way the volatile constituents of the liquor are carried over to the saturator, where the ammonia is arrested by sulphuric acid, and the exhausted liquor flows out in a continuous stream from the bottom of the chamber. The saturator is generally an air-tight leaden vessel, about 4 or 5 feet square and 3 or 4 feet deep, containing a charge of diluted sulphuric acid—equal parts of chamber acid (1600) and water. When the acid is saturated with ammonia, which is known by test-papers, steam alone is blown into it for about half an hour, to displace all traces of sulphuretted hydrogen, and the solution is drawn off into open pans or troughs, where it is evaporated by means of a closed coil of high-pressure steam set in the solution.

Another kind of saturator occasionally in use is a leaden vessel divided into two compartments by a diaphragm or curtain, which descends below the liquid to within about 18 inches of the bottom. One of these compartments is closed air-tight and receives the volatile products of the still, where they meet with a graduated stream of brown acid (sp. gr. 1720), which continually neutralizes them, and forms crystals of sulphate of ammonia, which are constantly ladled out of the open compartment. The apparatus is ingenious, and saves much labour and time in evaporation, as the acid is used in its undiluted condition; but it is not so certain or satisfactory in its action as the closed saturator before described.

In both cases the uncondensed gases—sulphuretted hydrogen and carbonic acid—with much steam, are conveyed from the saturator through a 4-inch pipe to the furnace fire, where the sulphuretted hydrogen is burned. It is necessary, however, that the sulphuretted hydrogen should be deprived of its moisture before it reaches the fire, or it will extinguish it; and this is effected by throwing the pipe into coils, or otherwise cooling it. The precautions, therefore, to be taken in the conduct of this business are—

1. The transference and storeage of the gas liquor in air-tight tanks guarded with boxes of hydrated oxide of iron.
2. The distillation of the liquor in a steady and continuous manner in air-tight stills by means of high-pressure steam.
3. The saturation of the ammonia in close vessels, and the complete expulsion of sulphuretted hydrogen from the saturated solution before it is drawn off for evaporation.
4. The condensation of moisture from the sulphuretted hydrogen evolved from the saturator, and the conveyance of the cold dry gas to the furnace fire where it is to be completely burned.
5. The treatment of the exhausted liquor from the still with cream of lime, so as to recover the residual ammonia by a second distillation; or, if the process be in operation at a gas-work, the use of the residual ammonia as an absorbent in the purification of gas.
6. The observance of the greatest care as regards the tightness of all parts of the apparatus.

Distillation of Coal Tar.

Another operation which demands care in its management is the distillation of coal tar for the various products derivable from it. There are two kinds of tar derivable from coal, according as the temperature of distillation is high or low, and according to the richness of the coal in hydrocarbon. One is ordinary coal tar, and the other is the tar from which paraffin oils are obtained. The tar produced from common coals at a high temperature (common coal tar) is always heavier than water (sp. gr. 1120 to 1150); it dries freely in the air by oxidation; it contains hydrocarbons with such an excess of carbon that they cannot be burned in a common lamp; it is almost entirely destroyed by strong oil of vitriol; it contains much sulphur, and its per centage composition is about 86 carbon, 7 hydrogen, 6·5 oxygen, and 0·5 sulphur. Whereas the tar produced from cannel coal at a low temperature is lighter than water (sp. gr. about 900); it will not oxidate, or dry in the air; it contains hydrocarbons of the paraffin series, which are comparatively poor in carbon, and which can be burned in a lamp; it is not much acted on by oil of vitriol; it contains little or no sulphur, and its per centage composition is about 84 carbon, 12 hydrogen, and 4 oxygen. Each of these tars is the subject of technical manipulation, which if not properly managed is the cause of nuisance, as are also the processes used in their primary production. In dealing with ordinary coal tar, it is proper that it should be stored and carried in air-tight tanks, and left covered with a little water. The delivery of it into the tank-barge, or tank-trucks, and from them into the tanks of the works, should be by means of pumps and air-tight flexible hose; and the openings of the barges and tanks should be guarded with a box containing hydrated oxide of iron, as in the case of ammoniacal liquor.

The distillation of coal tar is always conducted in iron stills, set over a naked

fire. The stills are of varying capacity, from 1200 to 5000 gallons, and the crown of them is always protected with brickwork to keep them hot, so that the later volatile products may not cool and condense and fall back into the still. The time of the distillation of a charge is from 12 to 15 hours, according to the capacity of the still; and the products are first condensed in a worm or pipe kept cool in water, and then received into a specially contrived box (varying in form and construction at different places) which permits the several products to flow away by separate pipes (four or five in number, and each provided with a tap) to their several tank receivers. This box is made air-tight, its cover being guarded by a water-valve; and it is provided with an ascending pipe, which carries the foul gases to proper purifiers before they pass into the furnace shaft. The gases which are evolved during the process of distillation are—first, sulphuretted hydrogen from the ammoniacal liquor which always accompanies the tar; then gaseous or uncondensable hydrocarbons; and, finally, the acrid vapours of the superheated pitch, with an abundance of sulphuretted hydrogen. These gases and vapours should be made to pass, first through a vertical condenser or scrubber charged with a stream of cold water, and then through an oxide of iron purifier with two or three trays of oxide, and finally to the furnace shaft. The necessary draught for these operations should be secured by means of a fan, or by the aid of the furnace shaft. It is proper to mention that, unless there is a draught of considerable power, the unavoidable leakage from the constantly loosening joints of the pipes will not be prevented. It is right, also, to state that it is dangerous to convey these gases and vapours into a furnace fire, as they are explosive when mixed with air, as they necessarily will be.

The products of the distillation of coal tar vary in different places. At one time they were but four, namely—1. Ammoniacal liquor and very light naphtha, which come over before the tar in the still begins to boil. 2. A crude naphtha which floats upon water, and is therefore called "light oil." 3. A creosote oil which sinks in water, and is called "heavy oil." 4. The residuum, which is a soft pitch. At present, however, in well-conducted works, the creosote or dead oil is run off in two portions—namely, an early portion, which is a mixture of creosote and heavy naphthas, which is used for burning in furnaces; and a later portion, which is best suited for the preservation of timber. This is followed by a greenish oil, which is sometimes collected apart, and redistilled with the anthracene oil that runs from crude pressed anthracene; and then follows a green oil (anthracene oil), which is allowed to flow until it gets very thick from the presence of chrysene. It is in the later stages of the process, when the high temperature of the still causes the decomposition of the pitch, that sulphuretted hydrogen and acrid vapours are evolved; and this also is the cause of the nuisance from the hot pitch when it is run off from the stills into open pits. To guard against this, it is proper that the fire should be raked out from under the stills directly the process is over, and the pitch should remain in the stills to cool for ten or twelve hours; it should then be run into close receivers, or into a properly constructed chamber, and allowed to cool for 24 hours before it is discharged into the final receiver. All these should be ventilated, so as to convey the vapours through the scrubbers and purifiers before mentioned. An excellent form of receiver for the pitch from the stills is a long air-tight chamber, which will bear internal pressure, and which communicates at the bottom with an outside trough, into which the cool pitch is forced by the weight of the hot pitch at each time of its discharge from a still. The pitch when cooled to a temperature of about 180° or 190° Fahr. may be freely exposed to the air, and be either run into pits or ladled out into moulds.

It may be interesting to know that the approximative yield of the several products per 1000 gallons of coal tar is as follows:—

Crude and light oil . .	sp. gr. 940 to 970,	from 24 to 40	galls.
Creosote oil	„ 1060 to 1070,	from 120 to 180	„
Anthracene oil	„ 1080 to 1095,	from 100 to 160	„
Pitch which melts at 176° Fahr.		3·2 to 3·6	tons.

These products are again submitted to further operations for the purpose of getting benzole, toluole, light burning and solvent naphthas, carbolic and cresylic acids, creosote for fuel and for timber, and anthracene; but the processes are not generally offensive, and, therefore, need not engage much of our attention, although a brief outline of them may be useful. The light oil is redistilled from stills with steam-jackets or with closed coils, or by blowing steam into it. That which flows up to a gravity of 940 is put aside for benzole and solvent naphtha, and the remainder is used for carbolic acid. The naphtha thus obtained is purified by treating it with strong sulphuric acid; it is then washed with lime water, and distilled for benzole and solvent naphtha. The heavier naphtha and the first runnings of creosote are washed with a solution of caustic soda for carbolic acid, which is subsequently separated from the alkali by neutralization with acid; and the green anthracene oil is allowed to stand until quite cold, when the crude anthracene separates from it in granular particles. These are strained off through canvas bags, and pressed in hydraulic or screw presses, whereby the crude anthracene of commerce is obtained. The approximative yield of each of these several products is—

From crude naphtha and light oil, from	6 to 10	per cent.	tar acid.
„ „ „	20 to 28	„	benzole.
„ „ „	10 to 15	„	solvent naphtha.
Creosote oil	10 to 15	„	carbolic acid, &c.
Anthracene oil	10 to 12	„	crude pressed anthracene.

For the purpose of increasing the yield of anthracene, the distillation of the pitch is sometimes carried on until a spongy coke remains in the still, and under these circumstances the acridity of the evolved vapours is most offensive, and requires the utmost attention to prevent their becoming a nuisance to the neighbourhood. The main points, therefore, to be observed in the conduct of works of this description are—

1. The transport and storeage of the coal tar in air-tight tanks or vessels guarded with boxes containing hydrated oxide of iron.

2. The proper construction of the primary receiver of the products of distillation, so that it may freely deliver them by special pipes to their respective receivers, and at the same time convey offensive non-condensable products to the scrubbers and purifiers.

3. The passage of the offensive non-condensable gases and vapours to a scrubber charged with a douche of cold water, from thence to an oxide of iron purifier, and thence to a tall chimney-shaft.

4. The proper cooling of the pitch in air-tight vessels before it is allowed to reach the external atmosphere, and the ventilation of these vessels through the scrubber and purifier before mentioned.

5. The use of a fan or other exhausting power, so as to draw all the noxious gases and vapours from the stills, the pipes, the receiver, and the pitch den, into and through the scrubber and purifier before mentioned.

The production of paraffin oil from cannel coal, and the distillation of the crude tar, as well as the distillation of petroleum and Rangoon oil, require like precautions, though not to the same extent, as the products are not nearly so offensive as in the case of coal tar products.

(To be continued.)

THE EUPION GAS COMPANY CASE.—On the 25th ult. an application was made to the Court of Queen's Bench, sitting *in banco*, to remove the case of the directors of this company, who are charged with conspiracy to defraud, from the Central Criminal Court into this court for trial. After hearing arguments on both sides, a writ of *certiorari* was granted. On Saturday last, the several defendants in the indictment attended at the Judges Chambers, before Justice Quain, and put in bail.

ON THE SULPHIDE OF CARBON LAMP, AND ITS VALUE IN PHOTOGRAPHIC OPERATIONS.

By MM. B. DELACHANEL and A. MERMET.

[Translated from the *Comptes Rendus* of the Academy of Sciences.]

We have the honour of bringing before the notice of the Academy a lamp acting with sulphide of carbon and binoxide of nitrogen, the flame of which appears to us to be specially suitable for photographic operations. Being unwilling to rely altogether upon our own experiments, we secured the co-operation of M. Franck de Villechole, a skilful photographer, who, by the aid of our lamp, succeeded in obtaining a number of plates and enlarged photographic reproductions.

When binoxide of nitrogen, containing the vapour of sulphide of carbon, is burned in a flask, a dazzling white light is produced, and the transitory flame thus obtained will cause an instantaneous explosion of the mixture of chlorine and hydrogen; the blue-violet colour of the resulting light betokening its richness in chemical rays. The existence of this richness has been amply confirmed by experiment.

The bisulphide of carbon lamp, through the agency of which this flame may be obtained continuously, consists of a two-necked flask, of 500 cubic centimètres capacity. This flask is filled with small pieces of sponge, coke, or, better still, perhaps, dried pumice-stone, saturated with sulphide of carbon. Into the central neck is passed a tube, reaching to within half a centimètre of the bottom; in the other is fixed a second tube of large diameter, and about 20 centimètres long. This tube, which may be of either glass or metal, contains iron filings very closely packed together, which act as a kind of metallic safety-pipe, preventing the return of the flame towards the reservoir, and thus lessening the risk of accidents from explosions. Binoxide of nitrogen is passed into the flask, and the gaseous mixture conveyed by means of an india-rubber tube to a species of Bunsen burner deprived of its supply of atmosperic air, as well as of the small conical adjustment that serves to regulate the inflow of the gas. This burner is also filled with iron filings.

The binoxide of nitrogen is produced in a cold state in the large apparatus of M. H. Sainte-Claire Deville. It is not a product of the decomposition of nitric acid by copper, which would be too costly a process, but a result of the action of iron upon a suitably proportioned mixture of nitric and sulphuric acids. One of the flasks contains a bed of fragments of porcelain, whereon several pieces of iron are placed; the other is filled with the acid mixture. Communication is established by means of a large india-rubber tube attached to the lower tubelures. A stop-cock is fitted in the cork of the flask containing the iron, and by this the supply of gas is regulated.

With an apparatus of suitable dimensions a brilliant flame, measuring not less than 25 centimètres in height, may be produced, and it was with a flame of these dimensions that we were enabled, with the assistance of M. Franck, to obtain several photographic plates.

In a special experiment, chloride of silver precipitated and spread upon a card was placed in a small dark-room, lighted by our lamp. In a very short time the silver had taken a violet-black tint, indicative of energetic reduction, and according to M. Franck this photogenic energy would be far superior to that of the artificial lights at present used by photographers.

In the course of a series of special experiments conducted in the laboratory of M. Franck, the sulphurous, carbonic, and other gases were received and conveyed away by a chimney, as they inconvenienced the operator, without, however, having any very decided action upon the sensitive plate.

M. Franck estimates that the photogenic power of our lamp is superior to that of the magnesium light, double that of the oxyhydrogen light, and three times as great as that of the electric light. Like the latter, our lamp gives an unintermittent flame, which is not liable, as is the case with magnesium, to cause annoyance by spontaneous extinction. The divergence of its rays permits of the illumination of a very large surface, and the light produced is one that the eyes are well able to bear. Finally, the net cost of our lamp is much below that of the other lights now in use. These combined advantages lead us to hope for its general employment, not only in photographic operations, such as making enlargements or reproductions, but also in the reproduction of microscopic and other objects relating to the natural sciences.

Analyzing our light by the aid of the spectroscope arranged with four prisms, we obtained a spectrum marked with a number of brilliant *striæ* very close together; with a single prism, however, the observation became more difficult; but if the slit of the instrument is narrow, brilliant zones are visible in the different parts of the spectrum. Mr. Lockyer, before whom this experiment was made, found great analogy between this spectrum and that of sulphur.

We are now conducting a series of experiments with the object of ascertaining whether the flame of our lamp possesses, equally with the electric and magnesium lights, the power of developing the green colouring matter of plants.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT.—A conference of the Liverpool Land and House Owners Association was held on Saturday, to consider the course to be adopted to resist the action of the Municipal Corporations Association for the repeal of the Borough Funds Act. The president (Mr. W. Pierce) said the meeting had been convened in consequence of a communication with Colonel Akroyd, late M.P. for Halifax, as to the necessity of a combined movement by the ratepayers of Liverpool and other large towns to oppose the repeal of the Act. It was well known that the agitation for its repeal originated with the town-clerks of Liverpool and Manchester, and it was certain a very powerful influence would be brought to bear upon Parliament. He believed if the valuable provisions of the Act were thoroughly known by the ratepayers there would not be a town in the whole kingdom but would raise its voice against the repeal of the Act. The Legislature had given the ratepayers the privilege of controlling the expenditure of local government, and had recognized their right by requiring the assent of the owners and ratepayers to all measures promoted by their representatives that were not strictly authorized by the Municipal Corporation Act, 1836. The ratepayers would not throw away the privileges Parliament had allotted them, at the bidding of a town-clerk here or there. It was, therefore, the imperative duty of the community to make a decisive stand against the repeal of the Borough Funds Act. If they refused to hold by the powers the Legislature had thought fit to give them, they must not expect in the future that Parliament would give much heed to their complaints or place much confidence in their demands. Mr. Waveli, of Halifax, said that the provisions of the Act conceded to the owners of property and the ratepayers the same privileges that were conferred by the Public Health Act in the election of local boards, and the powers were the same as those exercised in parochial elections. He could not conceive why objection should be taken by the representatives of municipal Government to the conditions requiring the sanction of owners and ratepayers. It was to the advantage of the representatives that they should have the confidence of their constituents, and any measure promoted by the local Parliament that had for its object the welfare of the community would always meet with the approval of the ratepayers. The Borough Fund Act was promoted by municipal corporations, and the section requiring the sanction of owners and ratepayers was fully considered, and adopted by the promoters. A suggestion was made that a memorial should be presented to the Home Secretary, and a petition to Parliament in support of the Act, and that a conference with other large towns should be had. It was further suggested that a deputation should wait on the borough and county members, and the secretary (Mr. John Murphy) was directed to communicate with the members for the borough.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is not as yet much real change to chronicle week by week in the general condition of the iron trade hereabouts, but there is in several branches of industry a distinctly better feeling. This more hopeful state of things is, in the main, the result of the knowledge that many large buyers are either already inquiring, or will very shortly have to put their specifications into the market. The reductions in prices which have recently been made by manufacturers of many classes of iron and manufactured ironwork will naturally encourage buyers to make their requirements known as soon as possible, it being exceedingly probable that the present prices are as low as, or even lower than, they can be expected to be at any time during the ensuing six months.

The foundry establishments are pretty well engaged on pipe work, colliery, and general machine castings, but they are not by any means unduly pressed with work. Pipes of ordinary dimensions are obtainable at from £6 5s. to £6 15s. per ton; smaller sizes rank at slightly higher rates, and are not in very good request. Pig iron continues easy in all directions, partly owing to the dulness of the finished iron trade, and partly owing to the greatly increased production which has gradually resulted from the extensive extensions of iron-works enterprises during the past year or two in almost every iron-producing district of the kingdom. North country pig iron is a few shillings per ton easier in several instances, as is evident from the following figures:—No. 1 foundry, 64s.; No. 2 foundry, 61s. 6d.; No. 3 foundry, 59s.; No. 4 foundry, 57s.; No. 4 forge, grey, 55s.; No. 5 forge, mottled, 54s.; No. 6 forge, white, 53s.; refined metal, 75s.; Kentledge, 63s.; and cinder pig, 44s., all for net cash, f. o. b. ship, or into railway waggons.

The coal trade remains in a quiet condition, being so dull, in fact, that my last week's anticipations as to a reduction in prices are on the point of being borne out by the facts. It is believed that on and after Feb. 1 the price of house coal will be reduced by from 1s. to 1s. 6d. per ton by many of the local colliery proprietors, who will also make a reduction of 6d. to 1s. per ton in the price of slack.

The South Yorkshire Steam Coalowners Association held an adjourned meeting at Barnsley on Tuesday, and, after some discussion, arrived at the determination to reduce the price of local steam coal 6d. per ton, making the current price, after the date mentioned, 12s. per ton, instead of 12s. 6d. as at present. Gas coal varies a little in price, but, on the average, is about 11s. 6d. to 12s. 6d. per ton at the pits, although some running contracts are being delivered at lower prices than these.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

A moderate degree of activity is still noticeable in the iron trades of this district, and prices are steady alike in the pig and finished departments. Some tolerable orders have been distributed during the past week, chiefly on account of the colonial markets. Sheets are in especially good demand, and makers of noted brands are again well supplied with orders, tin-plates, galvanized roofing sheets, hoops, and nail rods, command a brisk inquiry, and the prospects of business are most encouraging. Marked bars are steady at £10 10s., and sheets are quoted £12 10s. to £14 per ton. Pig iron realizes from £5 to £5 5s. per ton for hot blast native all-mine, and £6 to £6 10s. for cold blast. Cinder pig is firm at £3 5s. Stocks of all kinds of pig iron are now very low, and there is little doubt that additional blast furnaces will be put into operation as soon as fuel is reduced in price.

In the coal trade, prices for the better qualities both of household and manufacturing descriptions are still firm, and the labour dispute in South Wales has in some measure strengthened the market, but commoner qualities of manufacturing fuel are in abundant supply, and prices are weaker; indeed, at many of the smaller collieries in the South Staffordshire district, considerable difficulty is now experienced in disposing of the output. Coke of good quality is still in request, and prices are unaltered.

At Wednesbury the labour dispute in the tube trade is still unsettled. The operatives continue to hold mass meetings, and express their determination to resist to the utmost the proposed increase in the hours of labour, and a serious and protracted strike is not improbable.

The ironfounders are tolerably well employed on machine and general castings, and report a fair demand for gas and water mains, and the general hardware trades of the district are in well-sustained operation. At Stourbridge the makers of fire-clay goods experience an improved demand. Orders for gas-retorts, tiles, saddles, and other season requisites are now being placed.

The annual meeting of the Ironmasters Association was held at Birmingham on Thursday last, when Mr. J. P. Hunt, of the New British Iron Company, Corngraves, was elected chairman for the ensuing three years. It was also announced that the railway and canal companies had promised to give early consideration to the subject of the unequal freightage rates for iron as applied to this district, and hopes are now entertained that some concession will be made.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

A decidedly easier tone is beginning to be perceptible in the coal trade of this district—at least so far as regards the common classes of fuel—the supplies of which are now coming in freely. All good descriptions of coal, however, are still in full demand, and prices are steady at those last quoted; the pit prices in the Wigan district being about 15s. 6d. for best coal, 12s. to 14s. for seconds, 10s. to 10s. 6d. for common coal, 7s. 6d. to 8s. 6d. for burgy, and about 5s. 6d. for slack. In the gas coal trade there is not much alteration to notice, and the decrease in the consumption is not yet materially felt in the market.

The probable continuance of the South Wales strike is having the effect I anticipated. Consumers who have hitherto drawn their supplies from the above district are coming upon the Lancashire market, and at Liverpool there is a tendency in prices for steam fuel to stiffen to the extent of 2s. or 3s. per ton.

In the coke trade a fair business is being done both in Durham and local makes, the former being quoted at 27s. per ton delivered for good foundry qualities.

A conclusive proof is now offered that little further agitation is to be expected from the men in the Wigan district for a return to the old rate of wages. In the Skelmersdale district the masters granted the return of the 10 per cent., but on the condition that the men obtained it in the Wigan district. As, however, the Wigan District Committee now hold out no hope of any alteration in the rate of wages, the Skelmersdale colliery proprietors have reduced their men to the Wigan level.

A private conference of delegates, representing the various districts of the Amalgamated Association of Miners, which has been sitting in Manchester for four days, was brought to a close on Friday. The most important subject under discussion has been the South Wales strike, the result being that the men are encouraged to continue the struggle, whilst appeals for assistance are being made to the various trade organizations throughout the country. The future government of the association has also been under consideration, and it was resolved that the society should be placed on the same footing as the other large trade organizations throughout the country, the various districts being amalgamated more closely together.

In the iron market, Middlesbrough makes have been a trifle firmer for immediate delivery, but this is merely for prompt requirements, as for forward deliveries consumers will not buy, in the belief that prices will rule much lower than they are at present. Manufactured iron is a little weaker, probably to the extent of 2s. 6d. per ton, as compared with last week, and bars delivered are now quoted at £9; plates, £10; angles, £9 5s.; rails of heavy section, £7 12s. 6d.; and light ditto about 10s. per ton more. Merchants are selling manufactured iron out of stock at lower prices than makers seem disposed at present to take, and this is keeping many of the works bare of orders.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

An active business still continues to be done in gas coals in this district Steamers have loaded up for London and the larger ports of the South, and small vessels have been inquired for, to take cargoes down Channel. A few contracts have been made by the gas companies; but, compared with previous years, they are very limited. The rates remain pretty much as they have been for the past two months—namely, from 10s. to 12s. per ton at the pits. Very few gas coals are sold below 10s. or above 12s. Household coals continue in steady demand, and there is a considerably improved inquiry for steam coals. Great anxiety, however, prevails in the North with regard to the question of wages at the collieries. Affairs looked awkward in the Northumberland steam coal district on Saturday; for if an arrangement is not arrived at between the masters and men before Friday next, there will be every probability of a strike and the pits closed. Strong confidence, however, seems to prevail that neither side will drive affairs to an extremity if it can be avoided. In the meantime the business that is doing is simply to meet immediate wants. No contracts have been entered into in the steam coal trade, and the market is entirely open in that respect.

The freight market does not change very much, and it is not likely to do, so long as there are such a great number of steamers in the coal ports without employment. There is very little doing for the Mediterranean, and, until the wages dispute is settled, nothing will be done in advance for the Baltic or North Europe. The principal inquiry at present is for coals for the coasting trade. Some ships have been inquired after to load fire-bricks for London at 7s. 9d. per ton.

The iron trade of the Cleveland district is quiet, though, at the same time, a little more business is coming to the district. There is likely to be a serious disturbance in the shipbuilding trade. The joiners and carpenters having refused to submit to a reduction of wages, it is possible the iron shipbuilding yards on the north-east coast will be closed this week. If that occurs, a very great number of men will be thrown out of employment.

The chemical trade of the Tyne shows little signs of improvement. Orders do not come into the market, and the present prices are unremunerative. The wages difficulty is being settled in this trade upon a principle of give and take; but the manufacturers complain that the raw material, especially salt, is kept too high to enable them to make a profit on their business.

There was a rumour very current on 'Change in Newcastle on Saturday that a large continental gas company have recovered between £70,000 and £80,000 of an extensive coal company, for the non-delivery of coals during the recent excessive high prices.

Messrs. Fenwick and Hedley, who were appointed to value the North Shields Water-Works by the Tynemouth Corporation, with a view to the latter purchasing the same, have made their report. They estimate the works to be worth £66,254. The report of these gentlemen has to be considered at a special meeting of the council.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

It is gratifying to know that there is something fresh and of a progressive character to report in gas affairs. I refer to the system of gas-making with which the name of Mr. Malam, the manager of the Dumfries Gas-Works, is so intimately associated. I am informed that Mr. John Somerville, formerly engineer to the Alliance and Consumers Gas Company, Dublin, has undertaken to fit up the gas-works of no fewer than five towns in Ireland—Newbridge, Thurles, Mullingar, Roscrea, and Enniskillen—on the Malam system, so thoroughly convinced is he of its economic importance. The results recently attained with the retorts erected at Newbridge are highly satisfactory. English coal which, by the ordinary process, yields 9200 cubic feet of gas, has given 12,100 feet of gas by the Malam system of carbonizing, and without any deterioration in the quality of the gas produced. I understand that the Malam system is also about to be applied at Newton Stewart, in Wigtownshire. One set of the patent retort fittings has lately been sent to the Kensal Green station of the Chartered Gas Company, where the system is to be thoroughly tested by Mr. Brothers. The arrangements are so far advanced that definite results of the operations are expected in the course of the present month of February. Two sets of fittings have also been sent to Mr. John Eunson, Northampton, who expects to be able to give some results about the end of February. It has been reported that the Glasgow Gas Committee hope to be able to make arrangements to get the system put on trial at the Partick Gas-Works, when the operations are completed which are now in progress for connecting the Dawsholm Gas-Works, Maryhill, with the Partick areas of supply.

There are several facts of interest and worthy of notice in connexion with the pipe-founding trade. Inquiries have been made regarding the price at which 36-inch pipes can be supplied for a track of thirty miles. Replies are anxiously expected in regard to a Canadian contract for water-pipes. The offers were to have been opened and adjudicated upon within the last few days. Two or three Glasgow pipe-founding firms sent in estimates. Messrs. Thomas Edington and Sons (Phœnix Foundry) and Messrs. D. Y. Stewart and Co., are busily engaged on their Dundee water-pipe contract, and they have just commenced with a large contract for Berlin—some 16,000 tons of pipes, ranging from 36 inches in diameter downwards. A contract for about 10,000 tons of pipes for the Glasgow Corporation Water Commissioners has just been decided in favour of the same two firms, acting conjointly. The pipes are in part to be 48 inches in diameter, the largest I understand to have been made during the last 12 or 15 years, during which time the special plant required for such large pipes has been lying perfectly useless. It is expected, and confidently hoped, that the loan for £170,000 which has lately been thrown into the financial market by the municipality of Ancona, will be employed in part in carrying out the water scheme which has been under consideration in that famous Italian city any time for the last five years.

The Glasgow water supply is a topic of perennial interest, hence a few fresh facts regarding it may be mentioned at this stage. During the extraordinary frost of last December about 80 water meters were injured within the city, the expense of repairing which devolved upon the consumers, and about 1050 burst pipes had to be shut off by the commissioners' workmen. On Jan. 18 the quantity of water in store was as follows:—In the lochs, 119 days supply; Mugdock reservoir, 17 days supply; and in Gorbals reservoirs, 176 days supply. The quantity of water sent into the city and suburbs during the preceding fortnight averaged 34,850,000 gallons per day. The rate of supply during the last quarter of the past year was 33 million gallons per day, or 1,400,000 gallons more than the average in the same period of 1873. The 12 inspectors employed by the commissioners inspected 270,000 fittings of various kinds during the past year. The local authority of Dalry, in Ayrshire, have resolved on carrying out an excellent water supply scheme, the engineers being

Messrs. J. and A. Leslie, Edinburgh, and the probable cost about £8000. It is estimated that it will run 300,000 gallons per day, but an alternative offer has been made for pipes to run double that quantity.

There have recently been some large shipments of coal from the Clyde and other Scotch ports, amongst them being a quantity of gas coal for Brisbane, for which port there was likewise a shipment of gas-meters to the value of £260. To Havannah there have just been shipped 902 tons of gas coal, £834; gas-meters, £3933; fire-clay retorts, £3; fire-bricks, 185½ tons, £125. Some other shipments are the following:—To Antwerp, 202 tons of gas coal, £212; to Rio Janeiro and Callao, 1746 tons of gas coal, £3500; to Portland, U.S., gas-tubes, 4 tons 5½ cwt., £77.

Some qualities of coal have been advanced from 3d. to 6d. per ton since last report, and the prices of pig iron have somewhat declined, ranging during last Thursday and Friday between 73s. and 73s. 9d. Makers prices remain somewhat firm, with no sign of any reduction.

Reduction in the Price of Gas.—The directors of the Phœnix Gaslight and Coke Company have decided to reduce the price of gas supplied by them to 4s. per 1000 cubic feet from the 1st of April next.

Moreton-in-Marsh Gas Company.—On Thursday, the 21st ult., the annual meeting of the gas company was held under the presidency of Lord Redesdale. The accounts of the past year were considered highly satisfactory, and a dividenp of 4 per cent. was declared.

Strike in the Tube Trade.—At Wednesbury and Walsall, on Saturday, the workpeople in the employ of the Crown Tube-Works struck work against the notice for the discontinuance of the nine hours system—under which they have worked for three years—and a return to the ten hours system. Upwards of 1000 persons are out.

Hanley Gas Supply.—At the meeting of the Hanley Town Council on the 19th ult., a conversation took place relative to complaints recently made by the consumers, of the quality and pressure of the gas supplied by the British Gaslight Company, and correspondence between the town-clerk and the company on the subject was formally read with the minutes of the previous meeting. Satisfaction was expressed that, owing to the action taken by the council, the cause of complaint had been removed, and the borough was now adequately supplied by the company.

Fatal Accident in a Water-Main.—The Grand Junction Water-Works Company have been laying down a new 36-inch main between Hampton and Twickenham. On Wednesday last Peter Wood, aged 17, whose duty it was to sweep out the pipes, crawled up them for that purpose, accompanied by the nephew of the foreman, Charles Hunt. As they did not return, two other lads went up the pipe without finding them, and became overpowered with foul air. A pipe was broken into about a quarter of a mile from where the lads went in; Wood and Hunt were discovered apparently dead, but Hunt was restored to consciousness; the other lad was found to be dead.

Singular Accident at Folkestone.—The water supplied by the company to the houses in Cheriton Road has for some time past been very offensive to the taste, and in order to test the cause, Mr. J. Harris, residing at No. 24, requested his servant to procure it direct from the pipe leading into the cistern of the house. The girl took a small spirit lamp to light her for the purpose, when, on opening the cistern, an explosion of gas took place, setting fire to the girl's clothes, and severely burning her. It appears that the gas-main was faulty, filling the soil with gas, which found its way into the water-pipes. The leak was at once stopped.

South Staffordshire Water Company's Bill.—A meeting of the ratepayers of Upper Sedgley was held on Wednesday last, to consider the advisability of giving the local board power to oppose the South Staffordshire Water-Works Company's bill, next session, the cost of such opposition to be paid out of the rates under the control of the board. Mr. F. A. Homer, chairman of the board, presided, and in opening the proceedings said the water-works company were about to apply to Parliament for fresh powers, and to increase their area, and if the company obtained what they wanted, it would be a great hardship upon the ratepayers, as the bill was a one-sided measure. The clerk to the board having briefly stated the objects of the bill, Dr. Eagleton, who said he had no confidence in the wisdom of the local board, through whose neglect the district was as far off from getting a supply of water as it was six years ago, moved a resolution refusing assent to the expenditure of the rates in the proposed opposition. After some discussion this was put and carried.

Birmingham Corporation Gas and Water Bills.—A special meeting of the Aston Local Board was held on the 26th, to consider the expediency of opposing these bills, but, in consequence of the absence of a majority of the members, no legal vote could be taken. The subject was, however, discussed, and in the course of conversation it was remarked that the Mayor of Birmingham had held out as one of the inducements for the Town Council to take to the gas and water works, that great profits could be made, and the borough immensely benefited. That meant that the gas-rates would be increased, and that Birmingham would reap the benefit at the expense of the consumers in the suburbs. This had been shown to be the case in Manchester, where the gas-works were in the hands of the corporation, a handsome pile of buildings having been erected out of the profits of the gas. There seemed to be a unanimous feeling among the members of the board present, that the bills should be opposed, and the clerk suggested that, in order to save expense, Ashton should join some of the other suburbs in carrying on the opposition. The question was adjourned until the next monthly meeting.

Glasgow Water Supply.—Mr. Gale, the engineer of the Glasgow Corporation Water-Works, reports that the quantity of water sent into the city and district during October, November, and December last, averaged 29½ million gallons a day from the Loch Katrine works, and 4 million gallons a day from the Gorbals works; in all, 33½ million gallons a day, being 1,100,000 gallons a day more than during the corresponding period of 1873. The average supply for the whole of 1874 has been 33 million gallons a day, being 1,400,000 gallons more than the average of the previous year. Twelve inspectors of water fittings were employed during the past year, being the same as in 1873, and they inspected 270,000 fittings of various kinds, as well as attended to 9600 complaints, lodged at the office, of waste and want of water. The number of bad taps found in the ordinary course of inspection was less, in proportion to the number examined, than during 1873, showing a slight improvement in the condition of the water fittings in the city. Each inspector has at present, on an average, 55,000 people in his district. The Water Committee, at their meeting on the 25th inst., referred it to a sub-committee to consider and report upon the system adopted in Liverpool to detect waste water by meters over the city.

Chester United Gas Company.—The annual meeting of this company was held on Friday last, Jan. 29.—Mr. F. L. Bagnall in the chair—when the following report from the directors was received and adopted: "From the annexed statement of accounts for the year 1847, it will be seen that, after providing for the interest on borrowed capital, and the dividends on preferential stock, there remains a balance of £3820 5s. 10d. available for payment of dividends on the ordinary stock and new share capitals of the company; and although this amount is less than the balance for the previous year, it is sufficient to enable the company to pay dividends at the rates of £9 10s. and £6 13s. per cent. on the ordinary stock and shares respectively, and the directors recommend that dividend be paid at these rates in respect of the past year. The contract for coal entered into by the directors in 1871 expired in August last. Owing to the state of the coal market, the directors decided to enter into a fresh contract for 12 months only. The large advance in the cost of fuel, under the new contract, rendered it absolutely necessary to increase the charge for gas, and, since the 1st of September last, the price for gas supplied by meter has been increased by 6d. per 1000 feet, and the charges for public lamps accordingly." After the adoption of the report, and the declaration of the dividends recommended, therein, the retiring directors and auditor were severally re-elected.

The Sub-Wealden Exploration.—Mr. Willett, the honorary secretary reports that at a meeting of the Sud-Wealden Exploration, just held, the treasurer's report presented showed a balance in hand of £510 19s. 10d. besides over 1500 conditional promises, of which £15 has been promised since the 1st inst., the larger portion promised being for the extension beyond 1000 feet. Major Beaumont, M.P., and Mr. Gulland attended on behalf of the Diamond Boring Company, and stated that all their difficulties had arisen from their original mistake of attempting to increase the depth of the 9-inch bore, instead of beginning *de novo;* that, although the obstructions might yet be removed, they had come to the conclusion that valuable time would be saved by commencing a new bore forthwith; they would undertake to do this to the depth of 1000 feet (including lining tubes) for £600; and that, subject to the condition of being permitted to terminate the contract should unforeseen difficulties arise, they would undertake an additional 1000 feet on certain terms mentioned. It was stated that the expenditure of £400 for enlarging and lining to 1000 feet had already been authorized, and that 5-inch lining tubes, passing through a 9-inch bore (Bosworth's portion), would be always liable to fracture or displacement. Although the sums already promised were mostly unavailable, yet, believing that the money would be forthcoming, Mr. Willett would be responsible as the contracting party. This fresh offer presents considerable increased expectation of attaining the 2000 feet. It was therefore moved by Mr. John Evans, and seconded by Mr. R. Goodwin-Austen, and carried unanimously—"That the new contract of the Diamond Boring Company be accepted." The question was also discussed whether change of site was desirable, but it was decided to adhere to the present one. Some additional subscriptions were promised towards the fresh work, and Mr. Willett was authorized to apply to the Royal Society for an additional grant, and to make known the change of contract to the various subscribers. He anticipates that the 1000 feet will be completed in about five months.

Widnes (Local Board) Gas-Works.—On Monday, the 25th ult., a meeting of owners and ratepayers of Widnes was held—Mr. Kent in the chair—for the purpose of supporting a bill to autorize the Widnes Local Board to extend the gas and water limits, to construct additional gas and water-works, "to improve their district, and raise further moneys, and for other purposes." The chairman said he thought it was scarcely necessary for him to enter into any lengthy explanation as to the necessity for promoting the bill, inasmuch as it was well known that at present the supply of both water and gas was insufficient for the requirements of the district. At the present time the district could take 2000 gallons more water per day than it was possible to provide. As to the gas, the works were altogether too small for the increased demands of the district, in illustration of which he alluded to the fact that, whilst in the year 1870 the number of houses supplied was only 736, in March of last year it amounted to 3332; and whilst in the year 1869 the consumers of gas were 318, last year they were 715. The board, therefore, purposed keeping the yard entirely for the manufacture of gas, and obtaining another site for the storeage of gas. He then proposed, and the meeting consented to, the promotion of the bill, except clause 35, with respect to footways and streets. Mr. F. Gossage said that the ratepayers need not be alarmed at the amount of money the board were applying for, because it was not necessary the board should spend all that they now sought to obtain, their only object being to secure sufficient powers to prevent further application to Parliament. He might mention, in proof of the increased demand, that in the year 1869 the total revenue from gas was £884, whereas last year it amounted to £8478. In reply to a question from Mr. Taylor, Mr. Gossage explained that under the provisions of the bill the board would not be obliged to supply any outlying district with water unless Widnes had a fuller supply. The chairman pointed out that a great quantity of water was lost owing to consumers neglecting to have defects in pipes promptly remedied. The motion was then unanimously adopted, and the proceedings terminated.

Register of New Patents.

2127.—Henty, G. A., Notting Hill, "*An improved trap for cisterns.*" Provisional protection only obtained. Dated June 18, 1874.

To provide against the ill effects arising from making the waste-pipe a conduit for sewer gases into the house, it is proposed to trap the waste-pipe by fitting to the upper end thereof an annular vessel, the inner wall of which is lower—say, by half an inch, more or less—than the outer wall, and place in the vessel a bell-shaped piece which will cover the open end of the waste-pipe.

2162.—Parkes, S. H., Birmingham, "*Improvements in or additions to lamps.*" Patent dated June 22, 1874.

This invention consists in supporting upon the lower part of the chimney of a gas or other lamp, a conical hood or bonnet situated horziontally, its axis passing through the brightest part of the flame. The conical hood has internally a polished and plated surface, and is supported upon the chimney by means of tubes fitting that part of the chimney within the conical hood. The smaller end of the hood is closed by a reflector, and to the larger or front end a circular frame glazed with a thin sheet of glass of a faint blue colour is jointed. By the use of this invention the eyes are screened from the light, while the surface or object, towards which the front of the hood is turned, is brightly illuminated by a light from which the excess of yellow and red rays have been absorbed, and which consequently has not the irritating property common to ordinary artificial light.

2185.—Gamboni, Harley Street, London, "*Improvements in pumps or apparatus for raising or forcing air or water.*" Patent dated June 23, 1874.

This invention consists of pistons having bags on one or both faces working loosely in cylinders containing liquid or air under pressure to avoid surface friction.

2179.—Newton, H. E., Chancery Lane, London, "*Improvements in gas-burners,*" A communication. Patent dated June 24, 1874.

According to this invention, a perforated ring of aluminium is secured at its edges within a hollow burner ring, within which is a deflector to equalize the flow of gas. A cylinder fitted at the lower ends of the arms to the Argand ring is removable with the burner from the body. A cylindrical valve within the body is operated by an eccentric, and a friction-spring is provided to hold the valve when adjusted. The wire arms holding the chimney or shade are made with a spring S bend, and inserted in holes in a flange around the body.

2209.—Haseltine, G., Southampton Buildings, London, "*Improvements in gas-engines.*" A communication. Patent dated June 25, 1874.

In the specification of patent No. 432, Feb. 10, 1872, for improvements in gas-engines, reference is made to the fact that the vapour of naphtha mixed with atmospheric air in proper proportions will form a gaseous compound, which upon being ignited can be used as a motive power for the engine therein described. There exist, however, certain practical difficulties in the way of employing the

vapours of light hydrocarbons with the apparatus shown and described in that specification, which it is the object of the present invention to overcome.

The invention consists in certain means for enabling a given quantity of atmospheric air as it is passing towards the combustion chamber of the engine from a reservoir, where it has been confined under pressure, to become carbonized by being brought into contact with a liquid hydrocarbon, which is vaporized by the air current passing over or through it, and such vapour being absorbed by the air, a compound results which possesses the constituents of carbon, hydrogen, and oxygen in proper proportions to furnish when ignited the agent of force for the motive power of the engine. The several charges for supplying the combustion chamber are successively mixed at the instant of entering the engine under conditions which obviate the necessity of any reserve of explosive compound, and thus is removed the chance of any danger resulting from any collection of the same in a reservoir preparatory to being applied by ignition to develop force.

2103.—Rafferty, T., Manchester, "*Improvements in apparatus used in connecting service-pipes, cocks, and plugs to main gas-pipes.*" Patent dated June 17, 1874.

The object of this invention is to prevent the waste of gas and accidents from explosions owing to the leakage of the gas from the main-pipes.

The improved apparatus consists of a bag made of india-rubber in the form of a frustrum of a cone, which is fastened to the gas-main by straps and buckles. In the interior are fixed self-acting closing and opening doors made of overlapping flaps of india-rubber to allow the drill, rhymer, and tap to be introduced or withdrawn as required, The drills, rhymers, and taps are worked in the ordinary way by a ratchet-brace, which is supported by a light stand or apparatus chained to the gas-main in a firm manner.

The accompanying drawing No. 1. is a view in perspective of the apparatus when in operation: *a* represents the gas-main to which it is required to connect a service-pipe, a cock, or a plug; *b* is a bag made of india-rubber in the form of the frustrum of a cone, within which are the valves or doors, *c*, shewn in section in fig 2; the upper one is formed by cutting a slit in a disc of india-rubber, and the lower one consists of two overlapping flaps of india-rubber; these doors yield to allow the tool to pass, and when the tool is withdrawn they close again by their own elasticity to prevent the escape of the gas. The base of the gas-bag is secured to the gas-main by three straps and buckles, and a ledge is made all round the base to form a recess to receive the borings and cuttings made in drilling the hole and in screwing.

FIG. 1

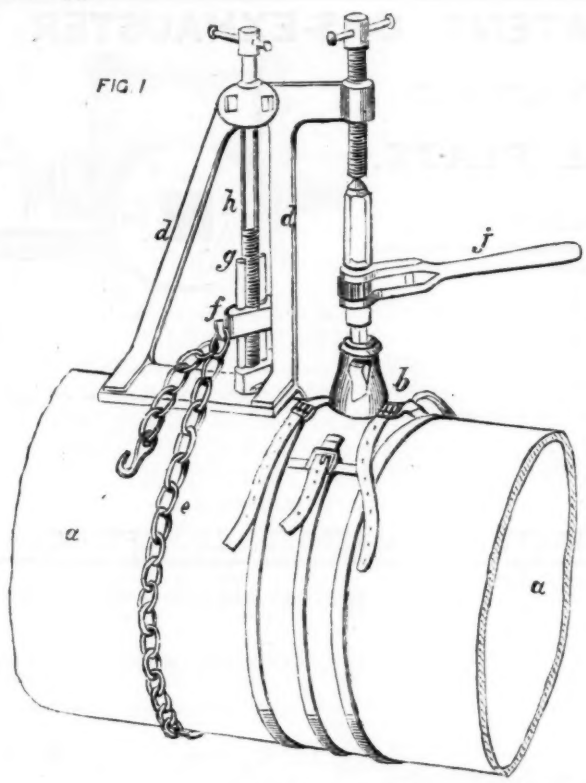
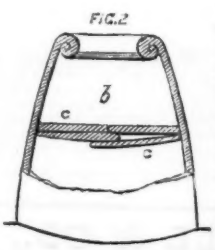


FIG. 2



The stand, *d*, is secured to the gas-main by the chain, *e*, which chain passes under the gas-main, and is hooked to the bridle, *f*, which is guided by the studs, *g*, and is raised by the screw, *h*, to tighten the chain. The stand, *d*, also supports the screw, *i*, the end of which bears upon the end of the ratchet-brace, *j*. When the chain, *e*, has been passed under the gas-main, and the ends hooked to the bridle, *f*, the screw, *h*, is turned round to tighten the chain, thereby holding the stand, *d*, firm while the hole is being bored and screwed.

The mode of operation is as follows:—When the stand, *d*, has been secured to the gas-main, the requisite hole is bored through about three-fourths of the thickness of the gas-main. The gas-bag, *b*, is then secured to the gas-main, care being taken that the centre of the bag shall correspond with the centre of the hole that has been partly bored. The boring tool is then passed through the gas-bag, and the hole is completely bored through. The boring tool is then drawn out, and the self-acting doors, *c*, then close and prevent the escape of the gas. The hole is then rhymered out, and then tapped by the usual tools. I make the drills, rhymers, and taps with a shoulder above resting on the top of the gas-bag, and this shoulder, as the tool penetrates the gas-main, serves as a joint to prevent the escape of gas. When the hole is screwed it is ready to receive the service-pipe, cock, or plug, but before removing the gas-bag the hole is closed by reinserting the drill, which has a recess near its shoulder to receive an india-rubber ring, and this ring prevents the escape of the gas while the apparatus is removed, and the service-pipe, cock, or plug is got ready.

The apparatus above described is cheap, portable, and not liable to get out of order, and it is so simple in its construction that it can be worked by any unskilled labourer.

APPLICATIONS FOR LETTERS PATENT.

261.—Colebrook, C. T., Islington, London, "Improved means or apparatus for raising water from wells or other places, or for raising other liquids." Jan. 23, 1875.

265.—Mills, E. C., and Haley, H., Gorton, Lancs, "Improvements applicable to motive-power engines worked by the explosion of gas." Jan. 23, 1875.

268.—Gill, D., Weston-super-Mare, "An improved method for neutralizing the poisonous and offensive nature of sewer or drain gas, and to deodorize the sewage." Jan. 23, 1875.

269.—Allen, W., Manchester, "Improvements in machinery for raising and forcing fluids and liquids." Jan. 23, 1875.

286.—Coby, E., Cardiff, "Improvements in motive-power engines, also applicable to pumps or measurers for air, gases, or liquids." Jan. 25, 1875.

294.—Cannon, W., London Road, Southwark, "An improved cup and ball joint for gas pendants and chandeliers." Jan. 26, 1875.

321.—Taylor, R., Oldham, "Improvements in machinery for tapping screw-threads." Jan. 28, 1875.

323.—Davey, H., Leeds, "Improvements in pumping apparatus worked by hydraulic pressure." Jan. 28, 1875.

326.—Weare, R., and Isherwood, S., Manchester, "An improved carbonaceous material suitable for filtering, deodorizing, and other analogous purposes, and in the apparatus employed in its manufacture." Jan. 28, 1875.

GRANTS OF PROVISIONAL PROTECTION.

150.—Rydill, G., Chancery Lane, London, "Improvements in machinery and apparatus in the construction and working of vessels, tanks, reservoirs, and areas, and materials used for the purification of sewage and other polluted waters." Jan. 14, 1875.

175.—Vera, P., Colombia, South America, "Improvements in gas or hot air engines heated by heat generated by chemical action igniting hydrogen and oxygen gases to form water." Jan. 16, 1875.

184.—Waller, G., Holland Street, Southwark, "Improvements in apparatus used in the manufactnre of gas." Jan. 18, 1875.

192.—Taylor, G. N., South Kensington, London, "Improvements in lamps for streets and other places." A communication. Jan. 18, 1875.

197.—Ross, O. C. D., Strand, London, "Improvements in apparatus and means for utilizing petroleum and other hydrocarbon liquids in lieu of coal or other fuel." Jan. 19, 1875.

198.—Clark, J. L., Westminster, "Improvements in gas-regulators and in lighting railway carriages by gas." Jan. 19, 1875.

210.—Dorat, H. J., Paris, "Improvements in gas-burners, gas-regulators, or apparatus for lighting by gas." A communication. Jan. 20, 1875.

211.—Mather, J., Gateshead-on-Tyne, "Improvements in the means for producing gas from an admixture of atmospheric air with paraffin, petroleum, naphtha, oil, or spirit containing a large amount of carbon, the said gas being adapted for lighting or heating purposes." Jan. 20, 1875.

214.—Box, J., Westminster, Aubertin, E., Boblique, L., and Leplay, H., Paris, "Improvements in the disinfection of solid and liquid matters, such as nightsoil, sewerage, either together or separately, gas and other foul waters." Jan. 20, 1875.

227.—Blakeborough, R., Brighouse, Yorks, and Beck, J., Great New Street, London, "Improvements in hydrants and fire-cocks." Jan. 21, 1875.

NOTICES TO PROCEED.

3164.—Barker, E. D., Bedford Row, London, "Improvements in valves for pumps and other engines." Sept. 16, 1874.

3178.—Newton, W. E., Chancery Lane, London, "Improvements in filters for filtering or purifying water and other liquids." A communication. Sept. 17, 1874.

3225.—M'Intyre, Port Glasgow, N.B., "Improvements in apparatus for purifying sewage waters." Sept. 21, 1874.

3249.—Knott, G. B., Gateshead-on-Tyne, "Improvements in tube cleaning and stopping apparatus." Sept. 22, 1874.

3699.—Hambleton, F. H., Baltimore, U.S.A., "Improvements in apparatus to admit of the continuous running of a pump or other apparatus supplying fluid through pipes when the flow through the pipes is for a time wholly or in part arrested, without injury to the pipes and without waste of fluid." A communication. Oct. 26, 1874.

4388.—Lake, W. R., Southampton Buildings, London, "Improvements in the construction of cylinders for pumps and steam-engines." A communication. Dec. 21, 1874.

4490.—Anderson, W., Southwark Street, London, "Improvements in centrifugal pumps." Dec. 31, 1874.

9.—Fish, W. S., Mystic, U.S.A., "A new or improved compound material applicable for packing stuffing-boxes of engines, pumps, and other mechanism, for packing joints of pipes, boilers, tanks, cylinders, and valve-chests, and others analogous thereto." Jan. 1, 1875.

112.—Sellars, J. C., Birkenhead, "Improvements in cement." Jan. 12, 1875.

135.—Scott, H. Y. D., Ealing, Middlesex, "Improvements in the purification of coal gas." Jan. 13, 1875.

NOTICE OF APPLICATION FOR LEAVE TO FILE A DISCLAIMER.

4088.—Turner, F. W., Hanover, "Improvements in motors to be worked by gas and air." Dec. 11, 1873.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2631.—Budenberg, A., Manchester, "Improvements in illuminated pressure and vacuum gauges." A communication. July 28, 1874.

2660.—Clarke, J. F., Moorgate Street, London, "Improved apparatus for distributing water in public thoroughfares." July 30, 1874.

2666.—Mushet, R. F., Cheltenham, "Improvements in the method of raising water and other fluids, and in the construction and arrangement of apparatus for that purpose." July 31, 1874.

2711.—Else, G. E., Horsforth, Yorks, "Improvements in valves or cocks." Aug. 5, 1874.

2758.—Scott, J. P., Manchester, "Improvements in motive-power engines, applicable also for pumping." A communication. Aug. 10, 1874.

2802.—Henry, M., Fleet Street, London, "Improvements in the method of and apparatus for obtaining ammonia from waste products and other matters." A communication. Aug. 13, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

83.—Hunt, B., "Improvements in meters for measuring water or other fluids." Jan. 10, 1872.

87.—Gowans, J., "An improved cesspool for preventing the escape of sewer gases into houses or other buildings." Jan. 11, 1872.

89.—Ronald, B., and Farmer, J., "Improvements in water-closets and their valves, which are applicable to other purposes." Jan. 11, 1872.

100.—Sellars, J. C., "Improvements in artificial fuel." Jan. 12, 1872.

103.—Johnson, J. H., "Improvements in the treatment and utilization of acid gas tars." Jan. 12, 1872.

104.—Benson, M., "Improvements in steam-engines for pumping and other purposes." Jan. 13, 1872.

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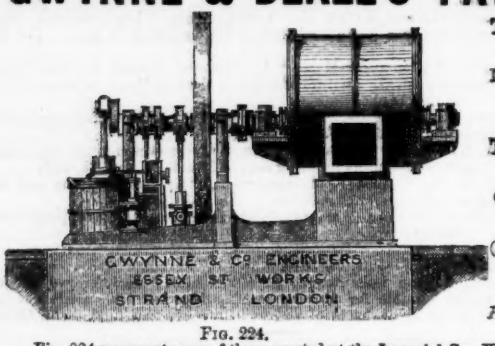

FIG. 224.

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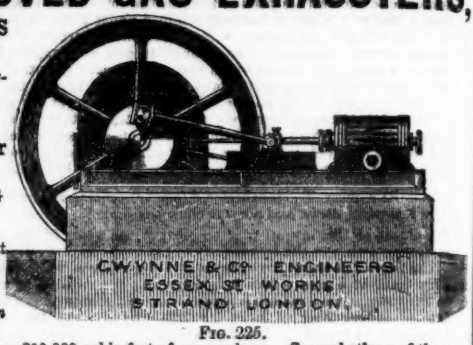

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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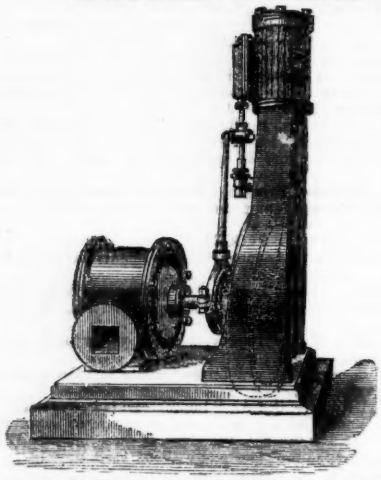
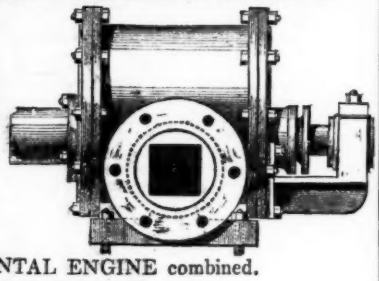


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



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Mr. G. LIVESEY, *President of the British Association of Gas Managers*, 1874.

"It was not until the Sulphur Question was brought so prominently into notice by the difficulty experienced at Beckton, that the important part played by carbonic acid as an obstructive was made clear; and for this knowledge, I think, we are indebted to Mr. Patterson, who, at a time when all the engineers and chemists were fairly puzzled, by much thought and labour was led to the conclusion that the presence of carbonic acid was the cause of the failure to effectually reduce the sulphur compounds where lime was used; and what was better, Mr. Patterson, in an official report, stated the things so clearly that no one has since pretended that there is any difficulty in reducing the sulphur compounds where the purifiers are of sufficient extent, and it is possible to use lime. . . . It is well known that the presence of carbonic acid in the gas diminishes the illuminating power; it is therefore worth while, *on that ground alone*, to remove it. I can state that while using nothing but Newcastle coal from the Holmside Colliery during the past three months, without a particle of cannel, the gas has never been below 16 candles, and has averaged 16·5 candles."—*Inaugural Address.*

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"I believe that we are approaching an era when all the gas will be purified without Lime Purifiers. . . . I have read one or two pamphlets which Mr. Patterson has published; and I am bound to say—in the absence of that gentleman, and promising that I have never seen him—that I believe that Mr. Patterson understands more about the purification of gas than any one present does."—*Proceedings of the British Association of Gas Managers*, 1874.

"There can be no doubt that Mr. Patterson improved the purity of the gas at Beckton, as evidenced by the great diminution of Sulphur in the gas subsequent to his instructions being carried out. . . . Mr. Patterson seems a gentleman who, had he been thrown upon a desert island—I do not mean the Isle of Dogs, or down in Beckton vicinity, but anywhere else—would have found out the true way to purify gas."—Mr. ANDERSON in the JOURNAL OF GAS LIGHTING, *Nov.* 4, 1873.

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"The hand of a skilled chemist is seen in these parts of the invention, and, whether the processes have been actually tried and found effective or not, they seem to us to promise well. The Soda and Sulphide of Sodium washing certainly merit a trial."—*Dec.* 3, 1872.

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WANTED, a steady, competent Man as FOREMAN of Gas-Works. Must understand working clay retorts, steam-engine, exhauster, and the manufacturing of gas in all its various branches. Annual make over 20 millions. Wages 30s. per week. House, coals, and gas. Good character indispensable.

Apply, in own handwriting, stating age, reference as to character, and particulars of previous employment, to MANAGER, Gas-Works, East Retford, NOTTS.

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WANTED, an appointment as Assistant to a Manager of a Gas-Work, without salary, but must reside with the Manager, and would pay a reasonable sum for board and lodging. Is over 21 years of age. Has thoroughly learnt the duties of an Inspector, and has had three years experience as a pupil on a small Gas-Work.

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GAS ENGINEER.

WANTED, by the Council of this Borough, a competent person to take full charge of the Gas-Works. He must possess the requisite qualifications of a thoroughly practical Engineer; be capable of preparing plans and superintending the construction of works; and have a sound knowledge of the manufacture and distribution of gas, and of chemistry as applied to its manufacture and purification. The salary offered is £500 per annum.

Applications, with testimonials, to be sent on or before the 1st day of March next, addressed to the undersigned, and endorsed "Gas Engineer." The person appointed will be required to devote the whole of his time to the duties of the office. Any candidate personally canvassing members of Council will be disqualified.—By order,

CAPEL A. CURWOOD, Town-Clerk.

Leeds, Jan. 22, 1875.

CLERK WANTED; a good opening for a Gas Manager's Son. Should have some knowledge of drawing, and be used to Gas-Works. Aged about 18.

Apply, stating experience and salary required, to W. W., 10, Queen Street Place, CANNON STREET, E.C.

A GENTLEMAN, for some years Accountant and Treasurer to a Foreign Gas Company, is desirous of an ENGAGEMENT with a Gas Company in England as Accountant or Collector. Unexceptionable references and testimonials. Security if required. Writes neatly and expeditiously, and is a good Accountant.

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SUPERINTENDENT OF GAS-FITTERS.

THE Directors of the Birmingham Gaslight and Coke Company require a competent SUPERINTENDENT for their Fittings Department.

Applications, by letter only, stating age, qualifications, and salary expected, to be addressed to the SECRETARY, at the Offices, 23, UNION STREET, not later than the 10th of February.

THE Sheffield United Gaslight Company require the services of an efficient and energetic MAN, fully qualified to undertake the entire superintendence (under the direction of their Manager) of the Gas-Fitting Department, with a staff of 50 foremen, storekeepers, and workmen. He must have a thoroughly practical knowledge of gas-fitting in all its details, of lead and iron piping for lighting, warming, and cooking purposes; also of lacquering and re-getting up of chandeliers, &c.

Applications to be addressed to Mr. T. ROBERTS, the Manager, stating age, salary, and qualifications.

FOR SALE, cheap, seven new circular Cast-Iron RETORTS, 14 in. diameter 8 ft. 6 in. long, with socket at back end, mouthpieces, and lids.

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FOR SALE—15 Round Retort MouthPIECES, 16 in. diameter with 6-in. sockets, new. Two Purifiers, 9 ft. by 5 ft. by 3 ft. 3 in., with lifting gear, &c., complete; 5-in. connexions. Condenser and Scrubber, box, 6 ft. 3 in. by 3 ft. 3 in. by 2 ft.; cylinder, 9 ft. by 1 ft. 9 in. Ready for use.

Address L. WILSON, 206, EUSTON ROAD, N.W.

THE Directors of the Petersburg and Viborg Gas Company, Limited, 29, Martin's Lane, Cannon Street, London, would be glad to receive the NAMES of IRON MERCHANTS, and others accustomed to the construction of Gas-Works, willing to enter into negotiations for the erection of works for this Company at St. Petersburg, upon terms to be agreed on.

Particulars will be forwarded to applicants who may address the BOARD on or before the 8th of February inst.

ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY.

THE Directors are prepared to receive TENDERS for the supply of 150 lengths of 24-inch PIPES, sundry Bends, Syphons, &c., according to specification, which may be had on application at the Office of the Company, 56, High Street, Rochester.

Tenders, marked "Tender for Pipes," to be delivered at the Office of the Company, on or before Wednesday, the 24th of February. W. SYMS, Secretary.

TO PURIFIER MAKERS.

THE Gas Committee of the Sowerby Bridge Local Board of Health are prepared to receive TENDERS for the supply, delivery, and fixing complete of four Dry Lime PURIFIERS, each 20 ft. by 11 ft. 6 in. by 4 ft. 6 in., with 15-in. connexions, Hydraulic Lifting Apparatus, &c.

Drawings and specifications may be seen at the Gas-Works, on application to Mr. G. E. Saville, Engineer.

Sealed tenders to be sent in not later than 12 o'clock at noon on Friday, the 5th day of February next, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Purifiers."

No allowance for tender, nor do the Committee pledge themselves to accept the lowest or any tender.

By order,

CHARLES BARSTOW, Law Clerk to the Board.

Town-Hall, Sowerby Bridge, Jan. 19, 1875.

TO GASHOLDER MAKERS.

THE Phœnix Gas Company, London, require TENDERS for the erection of a TELESCOPE GASHOLDER, at their Kennington Station.

Plans and specifications may be seen at the Engineer's Office, 70, Bankside, Southwark.

Tenders to be sent in on Wednesday, the 10th inst.

The Board do not bind themselves to accept the lowest or any tender.

I. A. CROCKENDEN, Secretary.

Phœnix Gaslight Company, Engineer's Office, Bankside, S.E., Feb. 1, 1875.

BIRMINGHAM GASLIGHT & COKE COMPANY.

THE Directors invite Tenders for the purchase of the GAS TAR produced at their Works in quantity about 5000 tons per annum, for a term not exceeding Three years from the 1st of July next.

The Tar will be delivered free into the purchaser's boats at the Company's Works.

Tenders, which must be at a price per gallon, or per ton of 200 gallons, for monthly cash payments, to be delivered to the Secretary not later than Wednesday, the 24th of February next, endorsed "Tenders for Gas Tar."

The Directors do not bind themselves to accept the highest or any Tender, and may require reasonable security for due fulfilment of the Contract.

Any further information may be obtained on application to the Chief Engineer, Mr. Charles Hunt, at the Gas-Works, Windsor Street.

By order of the Directors,
JOSEPH SLOCOMBE, Secretary.

Offices: 23, Union Street, Birmingham, Jan. 18, 1875.

YSTRAD GAS AND WATER COMPANY.

No. 2, GAS STATION—CONTRACT No. 2.
TO PIPE-FOUNDERS.

THE Directors of the Ystrad Gas and Water Company, Ystrad, Rhondda Valley, Glamorganshire, solicit TENDERS for the supply and delivery of the undermentioned lengths of Cast-Iron Common Spigot and Socket MAIN-PIPES, coated:—

350	Yards of	2-inch,	exclusive of	Sockets.
995	,,	3 ,,	,,	,,
2100	,,	5 ,,	,,	,,
7120	,,	6 ,,	,,	,,
100	,,	8 ,,	,,	,,

With all Branches, Receivers, Reducing Pipes, Curves, Bends, &c., and other irregular castings necessary in laying the same.

Copies of the specification, with conditions of Contract and form of tender, may be obtained on the 30th inst., on application to Mr. John Lees Cocker, Gas-Works, Merthyr Tydfil, the Company's Engineer.

Sealed tenders, endorsed "No. 2 Contract," to be forwarded to the undersigned on or before Monday, the 8th of February next.

The Directors do not undertake to accept the lowest or any tender.

By order,
FRANK JAMES, Secretary.

134, High Street, Merthyr Tydfil, Jan. 25, 1875.

Just published, price 10s. 6d.,

REGISTRATION OF DISTRIBUTORY PLANT.

The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.

South Shields.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

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To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

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By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

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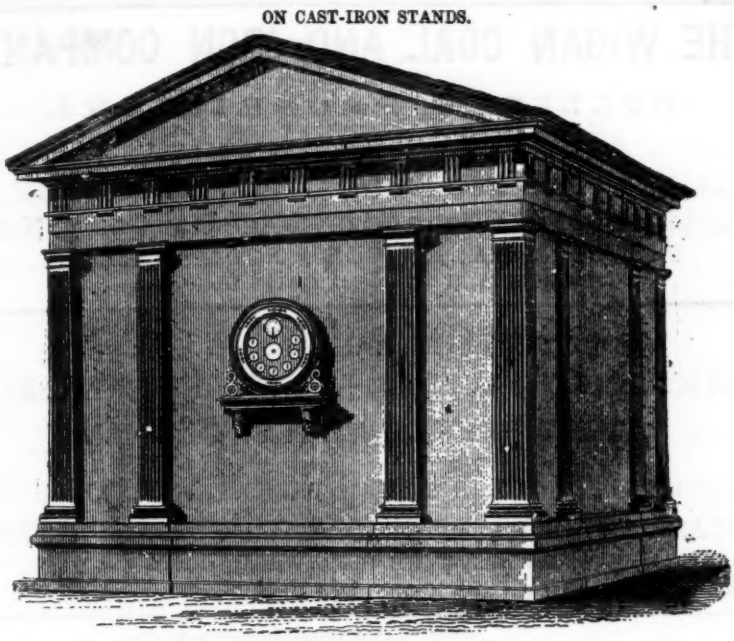

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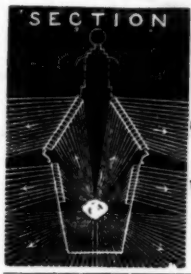

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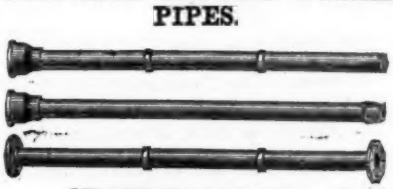

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(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
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NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

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Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Full Analysis and Prices on application.
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WYLAM WOOD CANNEL COAL WORKED FROM ABOVE COLLIERY.
Analysis—10,280 cubic feet of gas per ton of Coal, having an Illuminating Power of 26·2 Sperm Candles, and yields 13¼ cwt of Coke per ton of Coal.
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COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
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This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 33-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·0-candle gas.
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	Sample worked at Capledrae.		Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure	13,095 cubic feet.	..	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	..	34·83
Value of 1 cubic foot of gas in grains of sperm	780	..	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	..	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	..	71 minutes.
Gravity of the gas (air = 1000)	596	..	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.		Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	..	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	..	33·09
Value of 1 cubic foot of gas in grains of sperm	878	..	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	..	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	..	67 minutes.
Gravity of the gas (air = 1000)	677	..	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

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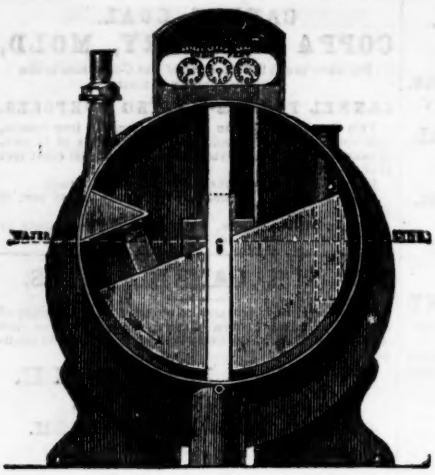

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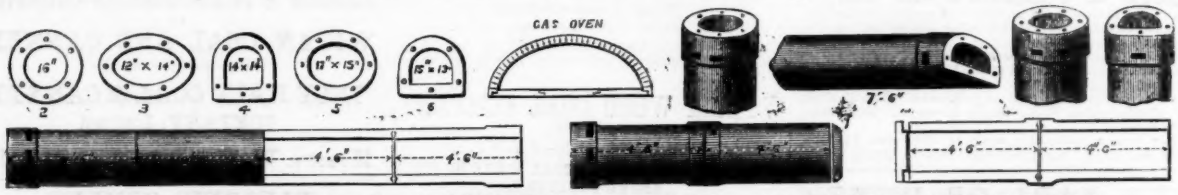

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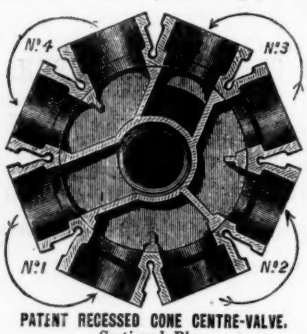

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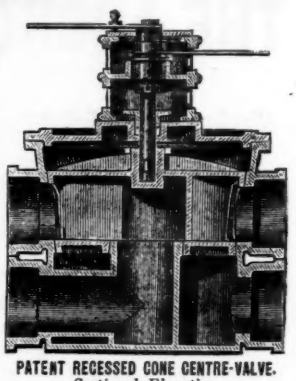

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